

Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

# Economic Empowerment of Women through Resilient Agriculture Supply Chains:

## A Geospatial and Temporal Analysis in Southwestern Bangladesh





# **Economic Empowerment of Women through Resilient Agriculture Supply Chains: A Geospatial and Temporal Analysis in Southwestern Bangladesh**

Yuka Makino

Maya Brahman

Juan Carlos Vargas

Sulhee Yoon

© 2019 International Bank for Reconstruction and Development / The World Bank  
1818 H Street NW, Washington, DC 20433  
Telephone: 202-473-1000; Internet: [www.worldbank.org](http://www.worldbank.org)

Some rights reserved

This work is a product of the staff of The World Bank with external contributions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent. The World Bank does not guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Nothing herein shall constitute or be considered to be a limitation upon or waiver of the privileges and immunities of The World Bank, all of which are specifically reserved.

This publication has been funded by the Australian Government through the Department of Foreign Affairs and Trade. The views expressed in this publication are the authors' alone and are not necessarily the views of the Australian Government.

Rights and Permissions



This work is available under the Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO) <http://creativecommons.org/licenses/by/3.0/igo>. Under the Creative Commons Attribution license, you are free to copy, distribute, transmit, and adapt this work, including for commercial purposes, under the following conditions:

**Attribution**—Please cite the work as follows: Yuka Makino, Maya Brahmam, Juan Carlos Vargas and Sulhee Yoon, 2019. “Economic Empowerment of Women through Resilient Agriculture Supply Chains: A Geospatial and Temporal Analysis in Southwestern Bangladesh.” World Bank, Washington, DC. License: Creative Commons Attribution CC BY 3.0 IGO

**Translations**—If you create a translation of this work, please add the following disclaimer along with the attribution: This translation was not created by The World Bank and should not be considered an official World Bank translation. The World Bank shall not be liable for any content or error in this translation.

**Adaptations**—If you create an adaptation of this work, please add the following disclaimer along with the attribution: This is an adaptation of an original work by The World Bank. Views and opinions expressed in the adaptation are the sole responsibility of the author or authors of the adaptation and are not endorsed by The World Bank.

**Third-party content**—The World Bank does not necessarily own each component of the content contained within the work. The World Bank therefore does not warrant that the use of any third-party-owned individual component or part contained in the work will not infringe on the rights of those third parties. The risk of claims resulting from such infringement rests solely with you. If you wish to re-use a component of the work, it is your responsibility to determine whether permission is needed for that re-use and to obtain permission from the copyright owner. Examples of components can include, but are not limited to, tables, Figures, or images.

All queries on rights and licenses should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; fax: 202-522-2625; e-mail: [pubrights@worldbank.org](mailto:pubrights@worldbank.org).

Cover photo: © GeoAdaptive, LLC  
Cover design: © GeoAdaptive, LLC

# Table of Contents

Acronyms and Abbreviations		07
Executive Summary		08
Acknowledgements		10
Data Limitations and Assumptions		11
Introduction		12
Chapter 1	<b>Economic and Enterprise Analysis</b>	<b>15</b>
	Women, Entrepreneurship and SMEs	20
	Initial Selected Products	22
	Product Characterization	24
Chapter 2	<b>Sociodemographic and Labor Force Analysis</b>	<b>33</b>
	Geospatial Profiling	34
	Multisectoral Assessment	56
	Insight: Linking Economic Products and Socioeconomic Assessment	69
Chapter 3	<b>Spatial Economic Structure Analysis</b>	<b>79</b>
	Dairy	82
	Fisheries	86
	Floriculture	90
	Environmental Challenges	94
Chapter 4	<b>Enterprise and Focal Zones Identification</b>	<b>97</b>
	Value Chain Functionality and Agglomeration	100
	Three Indexes for Barrier Evaluation	104
Discussion	<b>Women-driven SMEs Value Chains</b>	<b>107</b>
	Selection of Candidate Sites	108
	Value Chain Diagnostics and Assessment	110
	From Site Visits to Validation with Stakeholders	114
Annex	Annex A. Field Visit Insights	118
	Annex B. Technical Details	124
	Annex C. Data Catalog - Geospatial	128
	Annex D. Data Catalog - Trade Export Data	130
	Annex E. References	140



---

# Acronyms and Abbreviations

---

AOI	Area of Interest
BARC	Bangladesh Agricultural Research Council
BBS	Bangladesh Bureau of Statistics
BFS	Bangladesh Flower Society
BRAC	Bangladesh Rural Advancement Committee
DoF	Department of Fishery
EU	European Union
BFFEA	Bangladesh Frozen Fish Exporters Association
GDP	Gross Domestic Product
GOB	Government of Bangladesh
HSC	Higher Secondary School Certificate
ITC	International Trade Center
LGED	Local Government Engineering Department
NJILP	Nuton Jibon Livelihood Improvement Project
NREL	National Renewable Energy Laboratory
OSM	Open Street Map
RMG	Ready-made Garment
SCITI	Small and Cottage Industries Training Institute
SDF	Social Development Foundation
SME	Small-to-medium Enterprise
SSC	Secondary School Certificate
SWOT	Strength, Weaknesses, Opportunities, and Threats
USAID	United States Agency for International Development

# Executive Summary

The purpose of this report is to present the findings from a study on the Economic Empowerment of Women through Resilient Agriculture Supply Chains: A Geospatial and temporal Analysis in Southwestern Bangladesh. Recognizing that a common weakness in transport corridors has been the lack of participation and limited benefits accruing to the communities through which a corridor passes, World Bank investments in transport infrastructure are increasingly complemented by activities that facilitate the competitiveness of micro and small enterprises and economic opportunities for women and other disadvantaged people, and integrate gender-responsiveness into trade facilitation and logistics initiatives.

This geospatial and temporal value chain analysis in southwestern Bangladesh adopts a five-step methodology which overlays economic and initial enterprise analysis along this transport corridor, analyzes human capital (with particular focus on women) and the labor force along transport corridors, considers risk management in the value chain analysis, evaluates the economic structure of a value chain, and restructures the opportunities and gaps in areas where agglomerated economic activities were identified.

The report includes a total of four components:

- Chapter 1 - Identification and characterization of agricultural products that are representative of women driven, small-to-medium enterprises (SMEs) (See definition of women-driven SMEs on page 14)
- Chapter 2 - A geographical diagnosis of the population's sociodemographic and infrastructure conditions, and identification of constraints and opportunities regarding women-driven SMEs
- Chapter 3 - Value chain analysis for three agriculture products (fisheries, floriculture, and dairy) selected from Chapter 1. Analyses are represented in two formats: 1) diagrams, and 2) visualizations of spatial distribution
- Chapter 4 - Economic agglomeration and barriers for women-driven SME participation

**Chapter 1** starts with the identification of four (4) products in the agriculture sector that were selected through economic filters in order to identify those with large current and potential contributions to women-driven SMEs. From this selection, the study applies a spatial econometric approach using datasets from secondary sources, which allows for the evaluation of the territory's geographical and productive structure. The type of criteria includes an exploration of export trade value, domestic consumption, and productive capacity of each zila (see definition of Zilas and Upazilas on page 14).

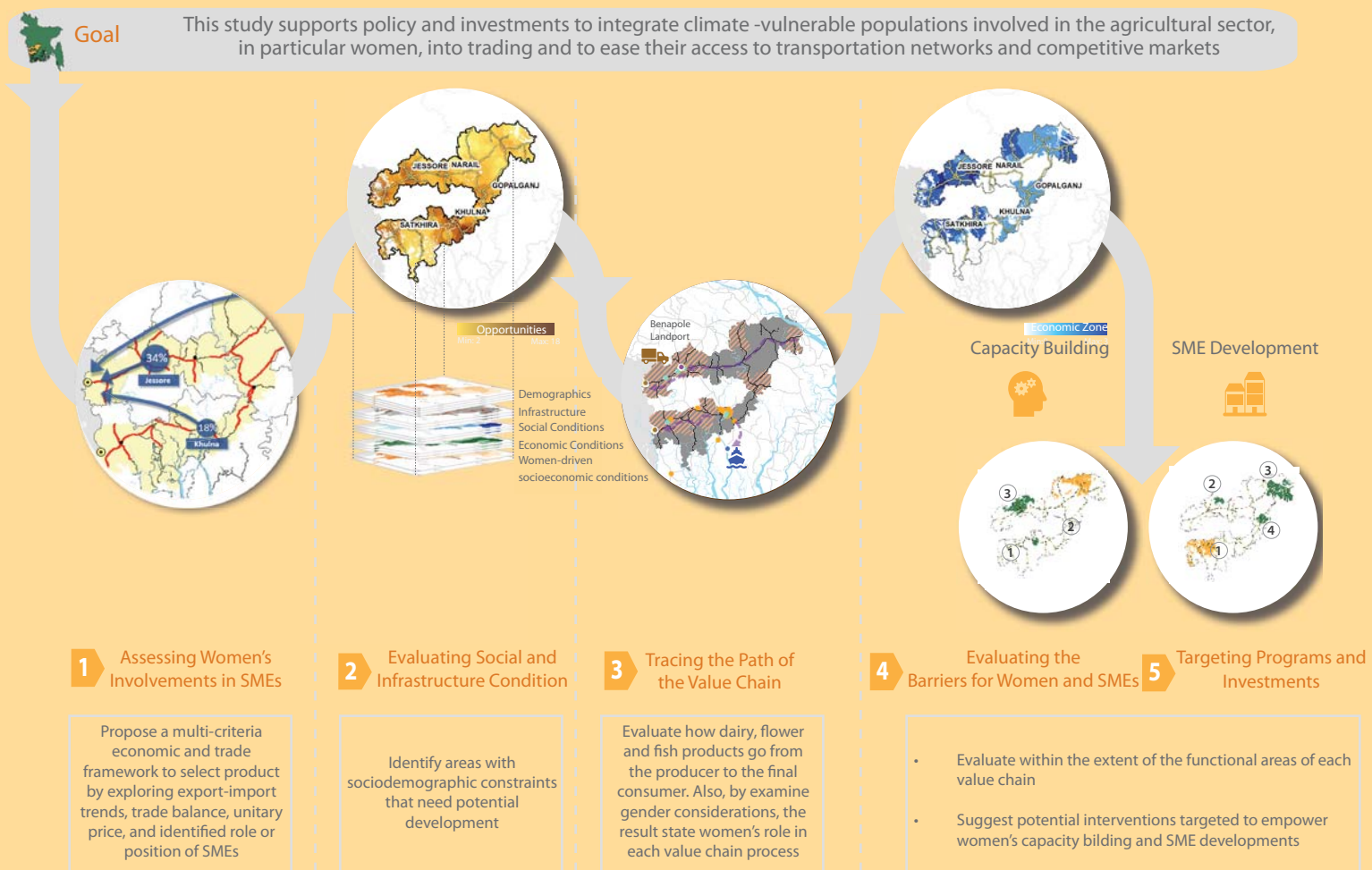
**Chapter 2** applies geostatistical analytics to determine the geographic profile of the population based on demographic composition, such as age and gender, to identify the size and spatial distribution of the current labor force as well as to examine density and population distribution across the study region. This diagnosis is categorized into five (5) characteristics including demographics, infrastructure, social conditions, economic conditions, and socioeconomic status of women. Geographic representations are derived from the latest census conducted by the Bangladesh Bureau of Statistics, 2011. The analysis identifies areas with the most favorable conditions for the promotion of women-driven SMEs by using results from the multisectoral opportunities analysis.

**Chapter 3** examines two types of economic structure of value chains for three products using both diagrammatic and spatial approaches. Diagrammatic representation is based on value-chain framework diagrams (Porter, 1985), representing different activities and states of development of the product from raw materials to the final commercialization. Spatial representation is developed through a geographic visualization approach that aids in identifying gaps and opportunities associated with spatial clusters of productive infrastructure.



Chapter 4 explores gaps and the most promising opportunities by integrating the results from Chapter 3. The results represent the clusters of economic zones in the region. In addition, this section identifies and evaluates barriers to participation of women-driven SMEs through three indexes: 1) women’s empowerment potential, 2) social services, and 3) infrastructure.

This geospatial and temporal analysis will help determine the capacity levels of women’s skills and identify gaps within the study region. In addition, it will help identify opportunities for women entrepreneurs and sectors and commodities that could be developed along the transport and trade corridors. The analysis will help identify the bottlenecks that will need to be addressed to ensure effective and efficient supply chains, and indicate specific regions of focus in southwestern Bangladesh.



---

# Acknowledgements

---

This report, *Economic Empowerment of Women through Resilient Agriculture Supply Chains: A Geospatial and Temporal Analysis in Southwestern Bangladesh*, will not only inform regional trade and connectivity in southwestern Bangladesh but also contribute valuable insights for women's livelihoods and agriculture investment.

The authors of this report are Yuka Makino, Senior Disaster Risk Management Specialist, World Bank; Maya Brahmam, Senior Communications Officer, World Bank Group; Juan Carlos Vargas, Founding Principal, GeoAdaptive, LLC; and Sulhee Yoon, Senior Data Scientist, GeoAdaptive LLC. This report presents the results of a geospatial and temporal value-chain analysis designed by GeoAdaptive LLC.



The authors would like to recognize the in-depth research conducted by the entire GeoAdaptive team. They would also like to thank Sumir Lal, Director ECRGP and Jill Wilkins, Director, ECREP of the World Bank for their support of this effort.

This report could not have been completed without the insights and recommendations of experts from across a number of sectors at the World Bank, including Manievel Sene, Senior Agriculture Specialist, South Asia; Aphichoke "Andy" Kotikula, Senior Economist, Gender; Luiza Nora, Senior Social Development Specialist; Maha Ahmed, Rural Development Specialist, South Asia Region; Diep Nguyen Van Houtte, Lead Transport Specialist; Erik Nora, Senior Operations Officer, South Asia Region; Muneeza Mehmood Alam, Economist, Transport, South Asia Region; Yue Li, Senior Economist, South Asia Region; Christoph Pusch, Practice Manager, South Asia Climate Change & Disaster Risk Management; and Sanjay Srivastava, Program Leader, Bangladesh. Thanks also go to Amani Haque and Md. Faruk Hossain from the World Bank Dhaka office for their help in coordinating the logistics for the field visits and project team consultations in Bangladesh.

In addition, many experts in Bangladesh provided invaluable contributions to help shape the research. These include the Ministry of Agriculture, Bangladesh; the Ministry of Commerce, Bangladesh; the Bangladesh Bureau of Statistics; the Social Development Foundation; the Bangladesh Rural Advancement Committee (BRAC); WorldFish; the Bangladesh Flower Association; the Bangladesh Agricultural Research Council; the Department of Fishery and Bangladesh Frozen Fish Exporters (BFFEA); the Bangladesh Agro-Processing Association (BAPA); the Bangladesh Foreign Trade Institute; CARE, Bangladesh; Dairy Revolution and Meat Production (DRMP); the Federation of the Bangladesh Chamber of Commerce and Industry; Hortex Foundation; the Metropolitan Chamber of Commerce and Industry in Bangladesh; the SME Foundation; and the Women Entrepreneurs Association of Bangladesh.

Finally, the authors would like to thank the women of southwestern Bangladesh for welcoming our team into their homes and businesses and demonstrating how hard they work to provide for their families and their strong interest in contributing to the economic development of their communities.

The study was funded by the South Asia Trade Facilitation Program (SARTFP), and the authors would like to thank Mandakini Kaul of SARTFP and the Australian Government for their support of this research.

---

# Data Limitations and Assumptions

---

This report covers research done during 2017. During this period, consultations with The World Bank and external stakeholders, spatial analytics, and field visits were conducted. Certain assumptions were made for the study, and data and methodological limitations are presented in this section.

- **Data Limitations**

Although missing data were collected during a mission in November 2017, most of the data and research findings are based on both tabular and geospatial data from multiple government sources in Bangladesh. The data collected are limited only by the datasets made available publicly by the Government of Bangladesh.

The timeliness of the data is subject to the time period during which the data was collected and produced by public entities in Bangladesh, such as the Bangladesh Bureau of Statistics.

Also, because this project aimed to apply geostatistical analysis at the most disaggregated level of the geographic unit- at the upazila level, there were limitations in incorporating data into analysis when these were recorded in aggregate, such as at the zila level.

- **Methodological Limitations and Assumptions**

Despite the advantages offered in this project, its methodological application includes assumptions made by using economic and socially disaggregated datasets. In response to this challenge, the study uses a simplified but coherent function of the economic aggregation that allows for territorialization. Details of methodological assumptions are described in Annex B.

- **Assumptions for Product Selection**

In order to select products for value chain and activities that offer a greater contribution to increase women's role in SMEs, this project analyzed the performance of agricultural sectors from three economic proxies of Bangladesh: 1) SME Clusters (SME Foundation, 2013), and 2) Women Entrepreneurs Directory (SME Foundation, 2015), and 3) trade data that were reported to the International Trade Center (ITC) database.

These sources of data were used as a reference to validate against product growth and to keep commodity data consistent through the analysis. Despite the existence of domestic trade statistics from the Export Promotion Bureau of Bangladesh, this study used the ITC dataset because it provides accurate estimates of commodity exports, as a joint effort from World Trade Organization (WTO) and United Nations Conference for Trade and Development (UNCTAD). It should be noted that trade data statistics from the Export Promotion Bureau of Bangladesh do not mirror the trade figures reported by the ITC database.

- **Assumptions for Transportation Access**

In terms of physical accessibility, this project assumed that the primary source to reach a destination is a personal vehicle and created a transportation model adopting a concept of mobility applying Cost Distance using up-to-date street segments of Bangladesh. The results provided the estimation of travel time (minutes) to the nearest source for each 30\*30m cell based surface area that conveys land use.

- **Assumptions for Socioeconomic Assessment**

In order to identify underlying spatial patterns of sociodemographic and infrastructure constraints and opportunities, this study developed a comprehensive index that conveys 19 conditions of socioeconomic status of people in the project area. While this approach identified coexistence of socioeconomic conditions based on the territorial patterns, social and spatial inequality by sector (e.g. education, health, and income) would need to be quantified in order to develop scalable policy solutions to empower populations to alleviate poverty and achieve better life outcomes.

---

# Introduction

---

The issue of the economic participation of women in Bangladesh is imperative since integration of women into workforce will be necessary if the country is to maintain high levels of the GDP growth over the long term. Women's economic empowerment is not just about access to economic assets but also to the physical infrastructure that provides transformative changes.

In the area of interest (AOI), the border area between the Jessore district in Bangladesh and the state of Bengal of India, Benapole presents itself as unique space for economic prosperity based on its geographic location as the main gateway for Indo-Bangla trade. Despite the country's economic growth and socioeconomic development in recent years, gender roles and the rural-urban divide drastically affect the distribution of opportunities. The southwestern Bangladesh region faces constraints relative to poverty, inequality, and the natural environment which is affected by salt water intrusion and changing patterns of rainfall.

Given these conditions, this project conducted an integrated and systematic spatial approach that aims to inform strategies and the implementation of economic and human development initiatives that could improve the current role of women entrepreneurs in SMEs.

## Objectives

- To identify products derived from row crops, livestock (ranching) and fisheries that are inclusive of women-driven SMEs, and to pursue resilience in agriculture supply chains
- To identify the sociodemographic characteristics of the AOI and to assess the current and potential labor force
- To develop an integrated assessment of the project based on an analysis of supply and demand
- To develop an analysis that presents clusters of opportunities and barriers where social and infrastructure agglomerations are present (Growth Pole Identification)

## Scope

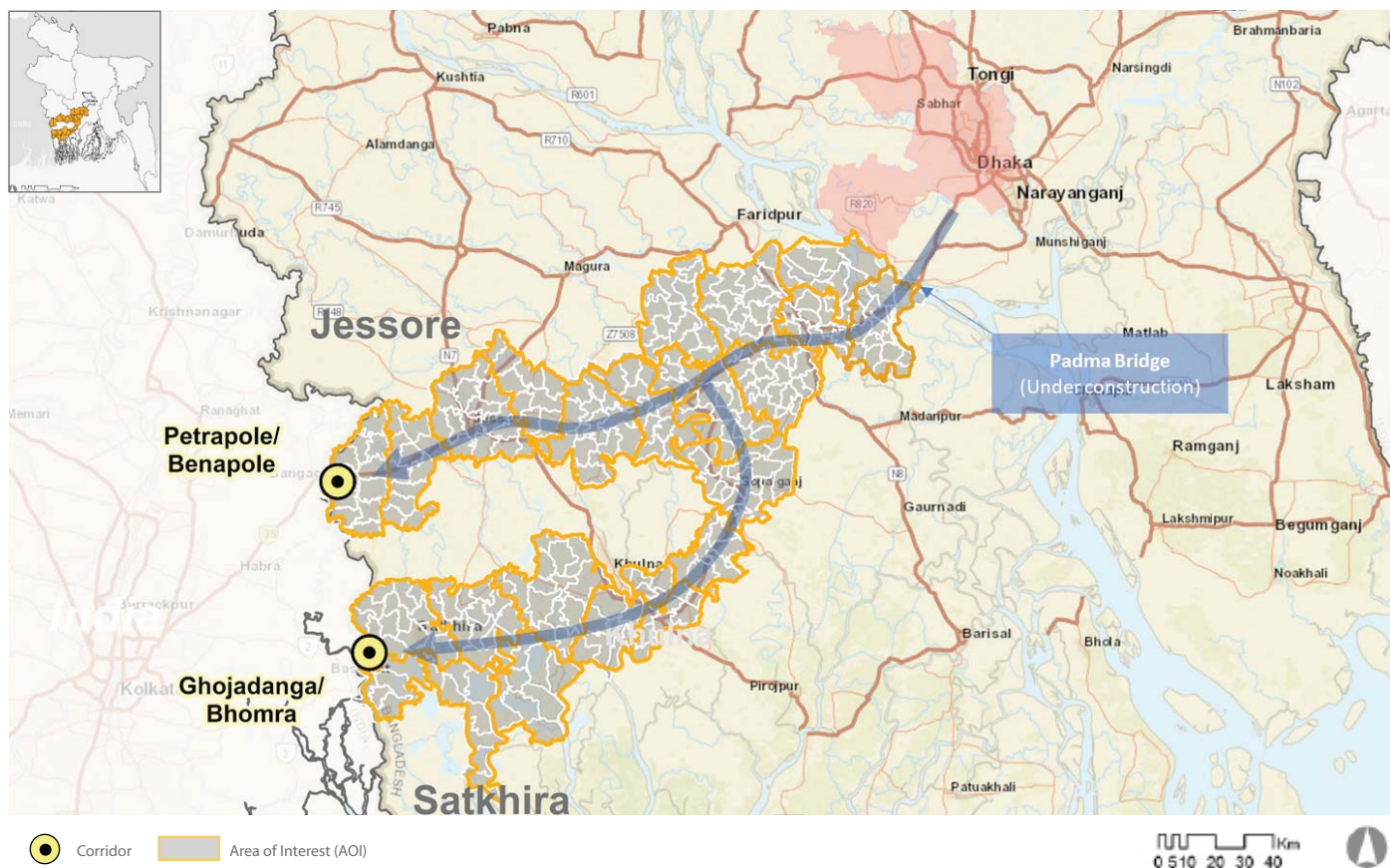
The study carries out a spatially explicit, in-depth socioeconomic and productivity assessment based on "GeoAdaptive's Inclusive Spatio-Temporal Value Chain Analysis", which will provide a foundation for the capacity building for women-driven SMEs. The study will identify the main barriers of participation in SMEs by women entrepreneurs in specific economic sectors across the Jessore District and the northern edge of the Sathkira District.

The activities associated with this technical cooperation are organized into four (4) chapters, each of them with a set of activities and products that will help identify critical conditions or interventions that should be considered in designing economic development strategies in this region of Bangladesh.

This study included field visits to Bangladesh that enabled the acquisition of data and first-hand experience, in support of the desktop-based research process. The combination of first and secondary datasets enabled greater understanding of the study area and how raw materials are transformed into value-added products.

## Area of Interest (AOI)

Given that the study focuses on a region important for regional trade, 26 upazilas were selected as the Area of Interest (AOI) that links Dhaka and two major transportation corridors. Also, the selection of the AOI was defined in anticipation of the Padma Multipurpose Bridge, which is expected to reduce the travel distance between the key trading and economic centers of India and Bangladesh.



- Border between Khulna Division and state of Bengal, India
- Dhaka- Benapole corridor
- 26 Upazilas (Thanas) in:
  - 2 Divisions- Dhaka and Khulna
  - 8 Zilas
- Major Upazilas:
  - Khulna sadar & Rupsha
  - Jessore sadar
  - Satkhira sadar
  - Narail sadar

Total Area	8760.7 sq.km
Population	6,821,693 (5.3% of country)
Average population density	778.7 (per sq.km)
Number of households	1,586,423 (5.0% of county)
Number of men	3,391,676
Number of women	3,430,017
Labor force (age 15-59) population	4,021,867 (59.0% of AOI)

### Box 1. Definition of Women-driven SMEs

Women-driven SMEs are enterprises with full or partial female ownership. Women entrepreneurs can make significant contributions to their economies by developing their productive capacity, generating employment and boosting household incomes.

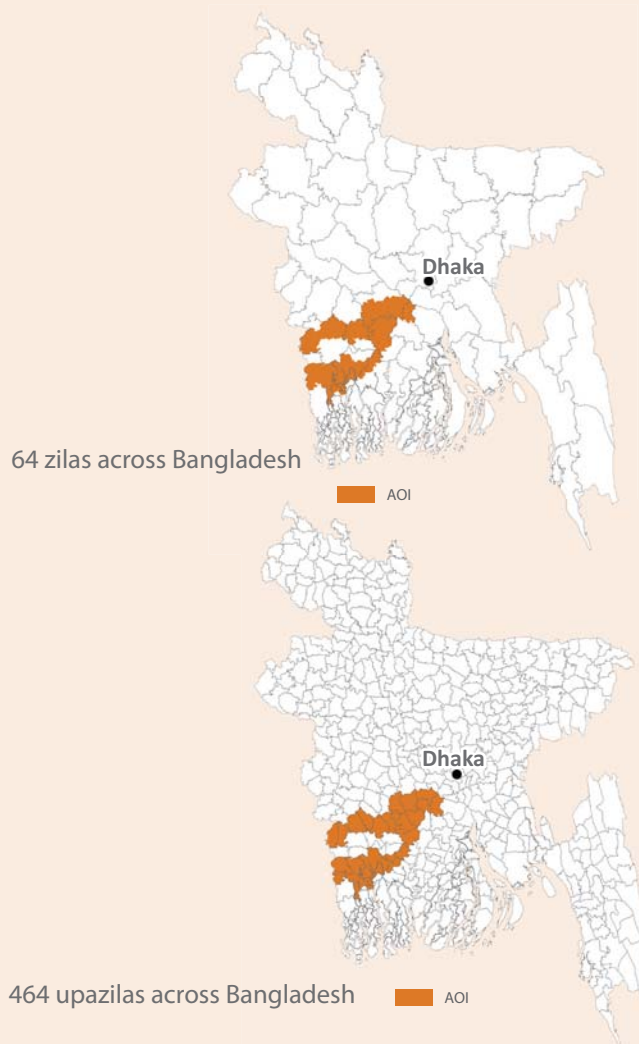
Following the definition of SMEs from the central Bank of Bangladesh, this study uses the term, “women-driven SMEs”, which refers to a firm or business fully or partially owned by women that is not a public limited company. Criteria of SMEs are provided below:

Small Enterprise		
Sector	Fixed asset other than land/building (Tk.)	Employment manpower (n)
Service	50,000- 5,000,000	25
Business	50,000- 5,000,000	25
Industrial	50,000 – 15,000,000	50
Medium Enterprise		
Service	5,000,000 – 100,000,000	50
Business	5,000,000 – 100,000,000	50
Industrial	15,000,000 – 200,000,000	150

### Box 2. Definition of Zila and Upazila

Zila and Upazila are geographical units used in Bangladesh. Upazila is a statistical division of Zila, and is the smallest geographical unit for which the bureau of statistics publishes the datasets.

According to the 2011 Population and Housing Census, Bangladesh is divided into 64 districts (known as zilas); and further subdivided into 464 sub-districts (known as upazilas). This study shows the conditions of selected 26 Upazilas in 8 Zilas in Southwestern Bangladesh.



# Chapter 1

---

## Economic and Enterprise Analysis

## Product Selection & Characterization



Image by GeoAdaptive



## BACKGROUND

While textiles (including ready-made garments [RMG]) are the primary economic engine accounting for about 91% of exports of the country (USD 34.4 Billion in 2016 (Observatory of Economic Complexity [OEC]), more than 38% of the population earn their income in agriculture, representing the largest employment sector in the country (BBS, 2011). Over 60 different types of agricultural crops are produced (Bangladesh Agricultural Yearbook, 2016), ranging from jute to pulses, fresh fruits, seafood, and livestock. In southwestern Bangladesh, production is focused on flower and pulses (lentils) which are typically grown on small and medium plots of land where water management is critical (SME Cluster, 2013).

## OBJECTIVES

This section describes the analytical approach and results of the agricultural product selection process. The project focused on the trade corridor that crosses the Benapole-Kolkata border, which is dominated by male merchants. Given this gender imbalance, the objective of product selection was to identify agricultural products with the greatest potential to increase the involvement of women in the productive sector. The analysis of this sector included two specific objectives:

- To explore and identify the most relevant products for women-driven SMEs in southwestern Bangladesh
- To characterize these selected products according to export trade, domestic consumption and regional productivity

In order to provide a general overview of the regional economy in southwestern Bangladesh, this section begins with an assessment of trade flows and trends. Next, a summary is provided of the three phases of the product selection process, specifically:

1. Assessing women, entrepreneurship and SMEs from: a) SME Clusters report (SME Foundation, 2013); and b) Women Entrepreneurs Directory (SME Foundation, 2015)
2. Identifying opportunities and challenges for selected products
3. characterizing each product selected based on relevant economic indicators

---

## Trade Trends in Southwestern Bangladesh

Across all economic sectors in the country, most of the transformational activity occurs in Dhaka and Chittagong where goods can then be easily exported through Dhaka International Airport or the Chittagong naval shipping port (McKinsey & Company, 2011).

The structural composition of the RMG sector and textile industries therefore is not inclusive of the geographical areas in the south-southwestern regions of the country, which can be characterized as rural. This lack of involvement in the region is largely due to the deltaic environment, which necessitates large infrastructure investments in order to transport goods across major waterways and create regional interconnectivity.

The Padma Multipurpose Bridge, which has an estimated cost of \$3.7 billion dollars (ADB, 2010), is an example of the type of the large infrastructure projects that are being built in order to integrate the south-southwestern region of Bangladesh. Currently, the fastest route from Jessore to Dhaka is approximately six (6) hours, which includes a ferry ride, whereas the fastest route by land increases the travel time to approximately 8.5 hours. Despite the lack of accessibility, a high volume of goods travel through Dhaka to Benapole-Bhomra corridor, with Benapole as a primary point for the transfer of goods into Petrapole (India). Even with the RMG sector's dominance, 3 out of the 5 goods with the largest trade value flowing into Petrapole (India) were agricultural (Figure 1).

## Constraints Related to Gender Norms

Social norms are considered to be indicative of economic trends and demands for products (Elster, 1989). From 2008 to present, Bangladesh has shown a gender transformation regarding education. Access to education for women has grown over recent years, increasing to about 72.5% of women attaining secondary education in 2016. Also, to help address social inequalities, the Bangladesh government and NGOs (e.g. BRAC) have initiated microfinance programs that have improved access to capital for over 11 million women.

However, due to sociocultural norms in Bangladesh, women continue to experience inequality, especially in rural Bangladesh. While the total number of women who are of working age tends to be higher than men (BBS, 2011), there is a persistent gender imbalance against women, as identified in various forms including economic participation, health and access to finance (WEF, 2017)

## METHODOLOGY

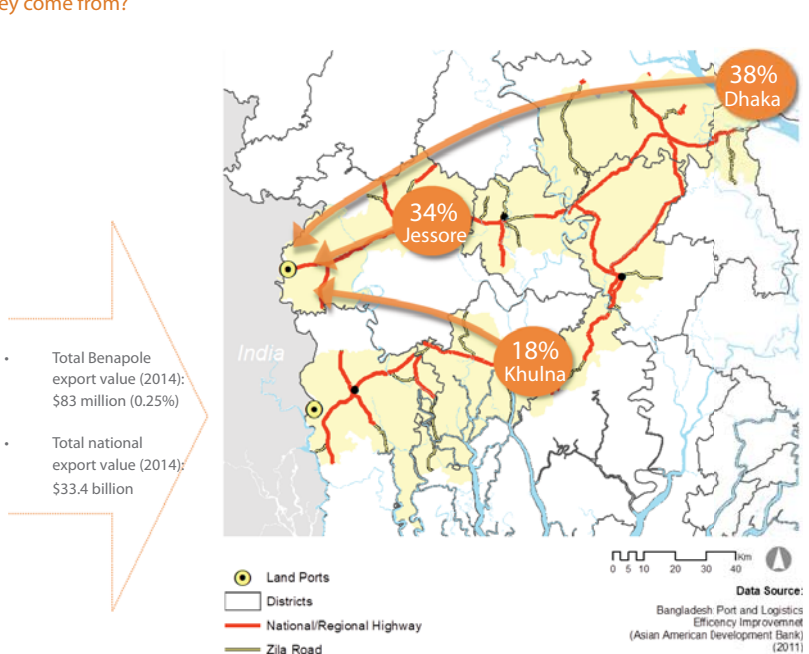
Residents of the study region are heavily focused on cultivation of crops, with about 45% working in the agricultural sector. Despite a large part of the labor force being engaged in agriculture, the sector accounts for about 20% of GDP and approximately 2% of the country's export value. Southwestern Bangladesh has rich and fertile lands for row crops, livestock and aquaculture products. The analysis sought to understand which of the products derived from these agricultural sectors were most representative of women-driven SMEs. With that said, the analysis focused on identifying products that already have women entrepreneurs active in the product space or SME product clusters that have high potential for women entrepreneurship in various stages of the product value chains.

This bottom-up approach ensures that women-driven SMEs are strengthened, and it increases the chances that an intervention in a value chain would be sustainable given sociocultural barriers to women in the workplace. In a 2009 study conducted by the SME Foundation on the role of women entrepreneurs in SMEs, 34% of female entrepreneurs stated that a major societal impediment to SME development in Bangladesh was the perception that people were not comfortable with women in business. Other multilateral stakeholders, such as the Asian Development Bank, also recognize that these attitudes are embedded in the overall social system and recommend that overcoming these gender-segregating traditions should place a short-term focus on “emerging industries in Bangladesh, such as those appropriate to women’s employment” (ADB, 2016). In the long term, they recognize that these barriers will need to be overcome in order to have greater participation of women in the workplace.

### What export goods go through Benapole and where do they come from?

Rank	Trade Goods	USD (2014 exchange rate)
1	RMG cotton including accessories	14,958,300
2	Jute yarn	12,468,942
3	Fresh fruits	10,487,585
4	Other jute manufactures	8,232,446
5	Cotton fabrics	5,417,082
6	Handloom products	3,695,263
7	Vegetable oils	3,114,466
8	Lead and products made of LED	2,638,117
9	Marine products	2,601,719
10	RMG manmade fibers	2,601,719
11	Miscellaneous processed items	2,334,267
12	Inorganic chemicals	2,285,208
13	Raw jute	1,995,601
14	Other textile yarn, fabric made-up article	1,960,784
15	Natural rubber	1,810,442

Source: Petrapole (India) land port import receipts (2014)



Map created by GeoAdaptive (2017)

Figure 1. Trade Flows and Products Through Benapole

# 1.1. Women, Entrepreneurship and SMEs

## 1.1.1. Women Entrepreneurs Directory (SME Foundation, 2015)

The starting point for research on women entrepreneurs was the comprehensive Women Entrepreneurs Directory (SME Foundation, 2015), described as a “database containing information on most women entrepreneurs in the country”. The directory has over 7,000 entries and spans 11 sectors in Bangladesh. For the purpose of the study, statistics on the frequency of products produced by women entrepreneurs were selected for the 8 zilas in the study area and for the agroprocessing and agribusiness, leather and jute sectors. Out of 19 products produced by women in the study area, two livestock products have the highest frequency as well as being indicative of women participation in multiple parts of the value chain. Out of 153 firms owned by female entrepreneurs, 36% produce dairy products and 32% produce poultry-related products.

From Table 1, it can be observed that relative to the poultry sector, women entrepreneurs are active in multiple links of the value chain and provide critical poultry production inputs, such as poultry feed and poultry medicine. In terms of row crops, rice (6%) has the highest frequency of women entrepreneurs; however, reports from multiple sources such as the International Rice Research Institute, indicate that women’s role in rice production is minimal and relegated to post-harvest activities.

In the fishery sector, shrimp and fish hold the highest frequencies, but fishery product is better represented, albeit by a small margin.

It should also be noted that women entrepreneurs are creating fish feed products, which further indicates that this product has more female involvement in important links in the value chain.

Product	Zila in the AOI	Number of Female Entrepreneurs
Dairy Products	Jessore, Satkhira	55
Poultry	Jessore, Satkhira, Khulna	33
Poultry Feed	Jessore, Satkhira, Khulna	12
Fish and Fish Feed	Jessore, Khulna	11
Rice	Khulna	9
Livestock	Jessore, Satkhira	4
Shrimp	Satkhira	3

Source: SME Women Entrepreneurship Directory (2015)

Table 1. Products with Women SME Entrepreneur Involvement in the AOI

### 1.1.2 SME Clusters (SME Foundation, 2013)

In addition to using the Women Entrepreneurs Directory (SME Foundation, 2015), the analysis used the SME Clusters (SME Foundation, 2013) to highlight products that have active and well-established SME agglomerations (See Table 2).

These clusters, which have been identified and mapped in order to provide institutional support, allow the study to identify products that have an established presence in southwestern Bangladesh, and highlight where focalized investments could have greater effect on enhancing the effects of product agglomeration.

Informed by the cluster analysis, the product selection criteria analyzed the industry clusters within the identified area of interest as defined by the project area. Figure 2 illustrates the fact that over 50% of the SME clusters found in the AOI are classified by the study as “Agroprocessing/agribusiness/plantation agriculture/specialist farming”.

A large percentage of agrobased SMEs signifies broadly that the region is suitable for the development of agroindustry. The product selection analysis also examined the products that are produced by the agro-processing clusters in the area of interest.

Although most SMEs in the area produce flowers, as shown in Figure 3, the product selection analysis identified a total of five products that have suitable SME clusters in the territory.

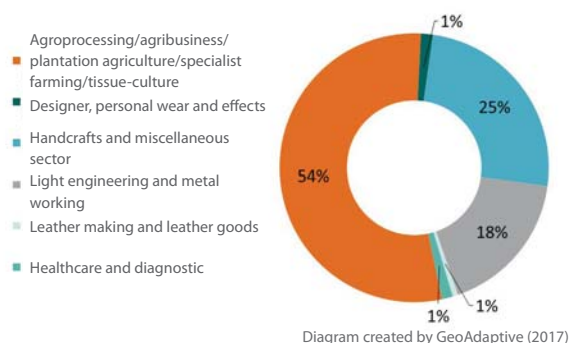


Figure 2. Proportion of SME products in the AOI derived from SME Clusters (SME Foundation, 2013)

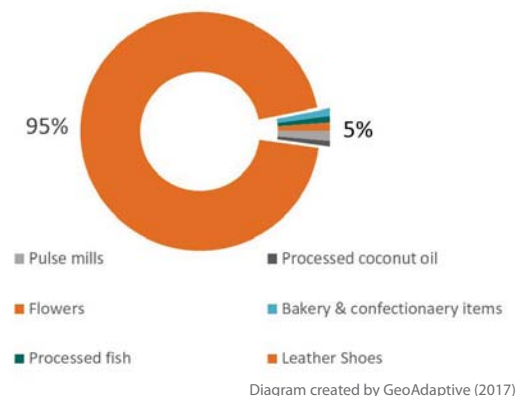


Figure 3. Proportion of SMEs in the AOI derived from SME Clusters (SME Foundation, 2013)

Product	Zila in the AOI	Number of SME Firms
Flowers	Jessore	4,000
Pulse Mills	Faridpur	60
Leather Shoes	Khulna	50
Bakery and Confectionary Items	Khulna	45
Processed Fish	Khulna	40
Processed Coconut Milk	Bagerhat	35

Source: SME Cluster (2013)

Table 2. SME Products with high agglomerations of firms in the AOI

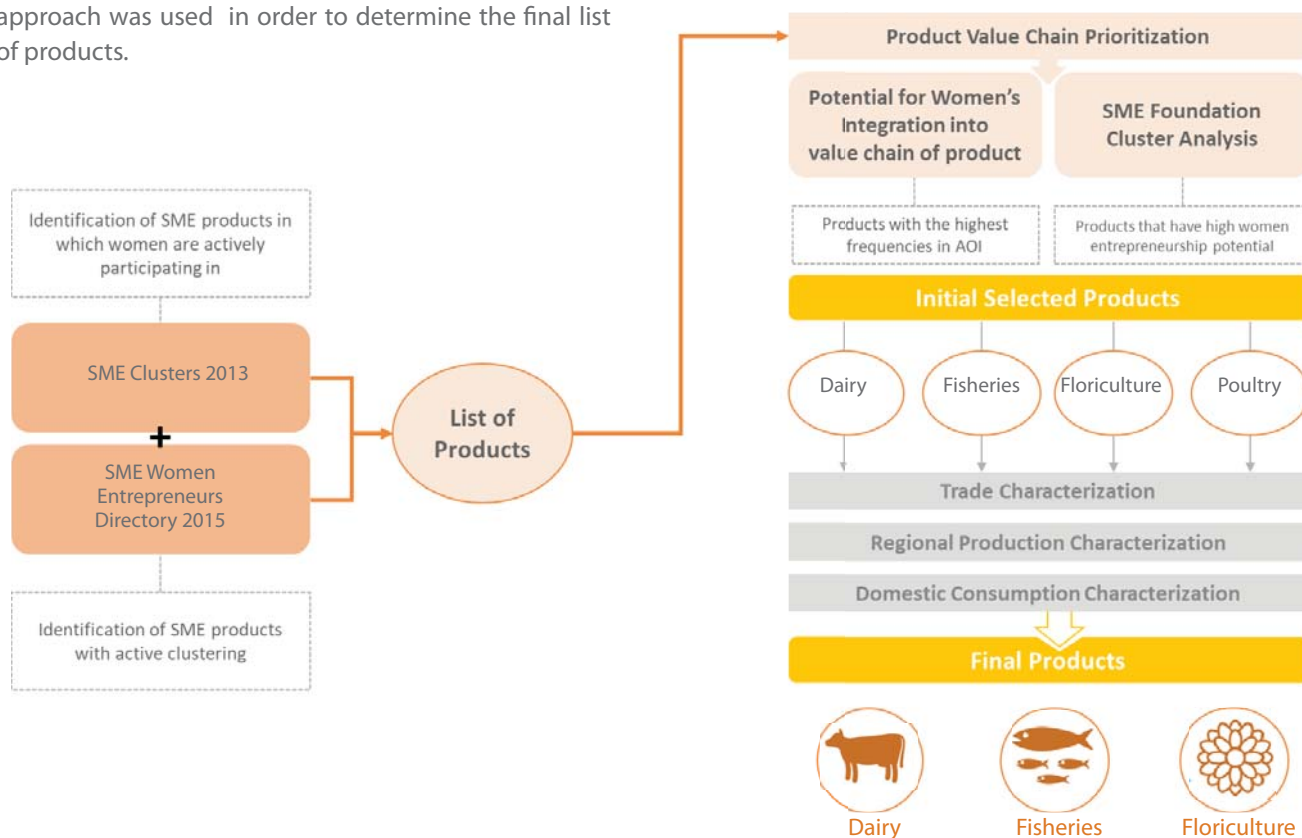
## 1.2. Initial Selected Products

The methodology employed in the selection of the agricultural products differed from a traditional export-based strategy due to the needs and scope of the project. While the research team provided a quantitative methodological approach to select products (Figure 4) in the AOI using SME Cluster (2013) and SME Women Entrepreneurs Directory (2015), the question of which products were most representative of SME women entrepreneurs in southwestern Bangladesh was one that could not be answered with aggregated trade export data. As this approach would have led to products that were suitable nationally but not appropriate for the study area.

Despite the limitations of an export-based analysis, the research team conducted an export review of products competitively produced in the area of interest, this approach analyzed these products across 9 different indicators (See Annex C). In the end, a more qualitative approach was used in order to determine the final list of products.

This qualitative approach led to the selection of four products across three sectors. The products that have been chosen will deliver the greatest benefit for SME women entrepreneurs in southwestern Bangladesh. Table 3 provides a brief overview of opportunities and challenges associated with the sectors. The rest of the chapter will characterize the products across trade, domestic consumption and regional production characteristics.

Although poultry was not selected as a final product because of its overlap characteristics with dairy, the initial products described here include poultry.



Source: GeoAdaptive (2017)

Figure 4. Product Selection Methodology

## 1.2.1 Summary of Products: Opportunities and Challenges

	Dairy	Fisheries	Floriculture	Poultry
Conditions for Women SMEs	<ul style="list-style-type: none"> <li>Largest number of agribusiness-related women entrepreneurs</li> <li>Precedence of women in entrepreneurial roles in the value chain increases likelihood of adoption of any possible capacity building intervention</li> </ul>	<ul style="list-style-type: none"> <li>Women entrepreneurs represented in both fish processing and fish feed SMEs in the study area</li> <li>After poultry, fishery agribusiness establishments were most popular among women entrepreneurs</li> </ul>	<ul style="list-style-type: none"> <li>Analysis showed no significant representation of SME entrepreneurs in the value chain; however, it is a prime candidate for a sector in which women entrepreneurs can play a large role in multiple links in the value chain</li> </ul>	<ul style="list-style-type: none"> <li>Women represented in multiple links in the value chain (live poultry, medicine and feed)</li> <li>According to the Women Entrepreneurs Directory (SME Foundation, 2015), poultry was most popular agribusiness activity (13.2%)</li> </ul>
Opportunities	<ul style="list-style-type: none"> <li>Rural women are typically responsible for rearing livestock in Bangladesh</li> <li>Existence of other dairy value chain initiatives (lessons learned from case studies in Bangladesh)</li> <li>Benefits across the population's nutrition, income and women's role in the economy</li> </ul>	<ul style="list-style-type: none"> <li>Study area has high suitability for fish production</li> <li>In-country positive case studies of cooperatives and exporters working together (shrimp sector)</li> <li>Cross-over market channels from shrimp sector</li> </ul>	<ul style="list-style-type: none"> <li>Women have high representation as producers</li> <li>Women have representation in high-end retail markets</li> <li>Strong market demand</li> <li>Large SME agglomeration in the study area (4,000 SME establishments)</li> </ul>	<ul style="list-style-type: none"> <li>One of the main sources of income for rural women</li> <li>Requires minimal land, small amount of capital and uses traditional technology</li> <li>89% of rural households rear poultry</li> </ul>
Challenges	<ul style="list-style-type: none"> <li>Publicly available land can be used for livestock fallow</li> <li>More transparency needed in the market channel to support fair pricing of milk</li> <li>Limited cold chain capacity</li> </ul>	<ul style="list-style-type: none"> <li>Limited cold chain accessibility</li> <li>Feed for fingerlings is imported into Bangladesh. Presents large costs to small- and medium-scale producers.</li> </ul>	<ul style="list-style-type: none"> <li>No cold chain integration</li> <li>Wastage during transport of flowers</li> <li>Limited cultivation know how outside of Jessore</li> <li>No indication of women entrepreneurs in SME floriculture development</li> </ul>	<ul style="list-style-type: none"> <li>Mobility of women is impeded due to women being primary caregivers. This affects the commercialization of product by women since they have little market interaction</li> </ul>
Initial Selected Products	X	X	X	X
Final Products	X	X	X	

Source: GeoAdaptive (2017)

Table 3. Overview of challenges and opportunities associated with agricultural products

## 1.3. Product Characterization

---

### 1.3.1 Livestock- Dairy Products

On the international stage, two products derived from dairy are positioned to be competitive for Bangladesh. Butter derived from milk fat and unsweetened milk are experiencing worldwide import growth at a steadier pace than the average for all products at -4%.<sup>1</sup> This bodes well since products derived from milk fat have increased their market share by 31% from 2012-2016. Unsweetened milk has the best potential for export profitability given that it has increased its market share by 116.5% in a 4 year period (2012-2016) and relative to the total export value of other products, it is still a growing sector.

Domestic consumption of milk was calculated using the Income and Household Survey of 2010. Daily consumption of milk at the household level is approximately 1 liter. A large portion of households in Bangladesh have one or two heads of cattle in order to meet the household demand for milk. The balance of trade for dairy-derived products also indicates strong domestic demand for dairy products.

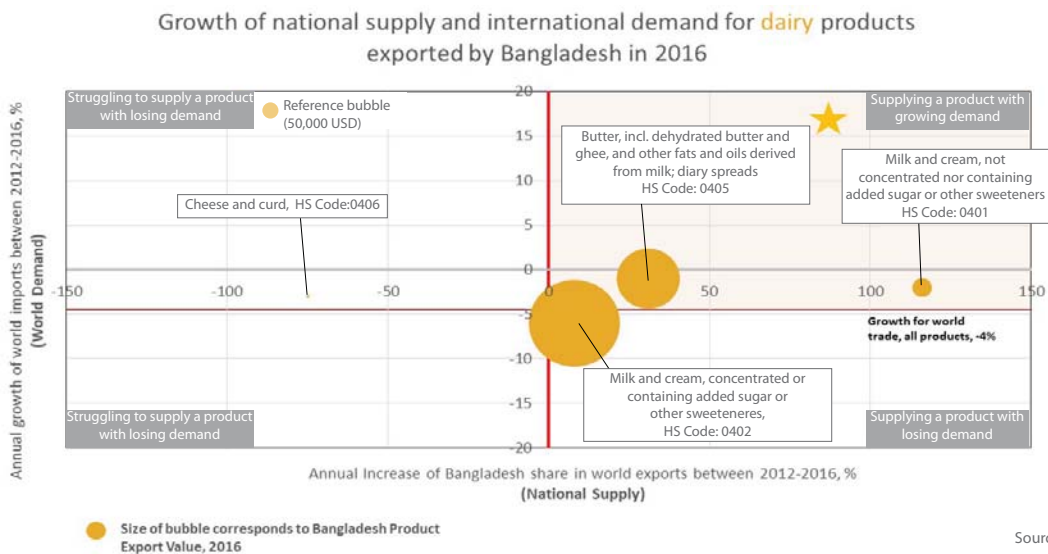
Lastly, in order to understand the regional production of cattle, Figure 7 identifies the districts in Bangladesh that are producing the most head of cattle. Within the study area the largest producer is Jessore followed by Satkhira.

---

<sup>1</sup> Retrieved from the International Trade Centre (ITC) Trade map of Bangladesh (from 2012 to 2016) on HS Code 0405 products- butter and other fats and oils derived from milk; dairy spreads



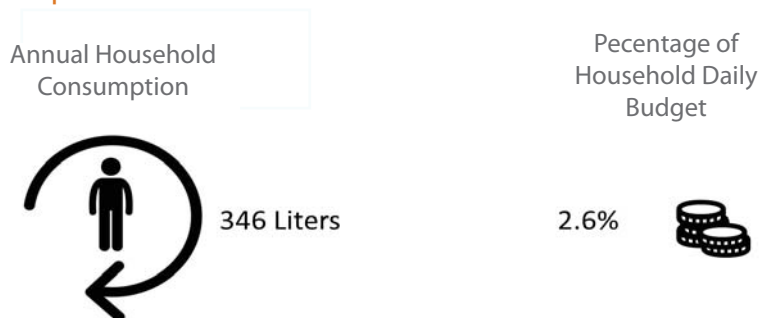
## Trade Characterization



Source: GeoAdaptive (2017)

Figure 5. Trade dynamics derived from ITC Trade Map Data

## Domestic Consumption



Source: GeoAdaptive (2017)

Figure 6. Consumption and Expenditure, Integrated Household and Expenditure Survey 2010

## Production

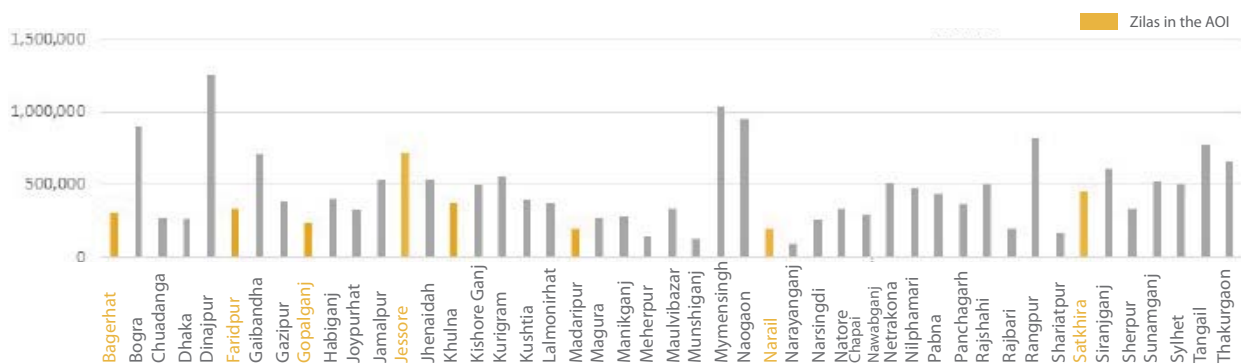


Figure 7. Cattle Production in Bangladesh, Agricultural Yearbook BBS 2016

Source: GeoAdaptive (2017)

## 1.3. Product Characterization

---

### 1.3.2 Fisheries

Bangladesh products derived from fisheries include products of processed fish such as fish fillets, frozen fish, dried fish, or live and fresh fish meat. In total, Bangladesh exported five types of fish products in 2016. While demand for each of them is higher than the average of all goods, increase in Bangladesh market share has decreased over the last four years (2012-2016) for 4 out of the 5 products. The fact that Bangladesh is not performing well in growing sectors points to supply-side barriers for these products. A product such as “Fish, fresh or chilled (excluding fish fillets and other fish meat of heading, HS Code: 0304)” could be enhanced through improvements to cold storage facilities or by regional trade agreements that cut down transport time for these types of goods.

Fishery products are highly consumed domestically as shown in Figure 9, which illustrates the fact that households eat more and spend more on fish, second only to grains such as rice and wheat.

This primary protein of choice is widely produced in Bangladesh, however the northern district of Mymensingh has clear advantage, producing over 316 thousand metric tons of fish, almost 100 thousand tons more than the second largest fish producing district of Comilla. Jessore and Satkhira are third and fourth, respectively, and are the two largest producers within the AOI.

## Trade Characterization

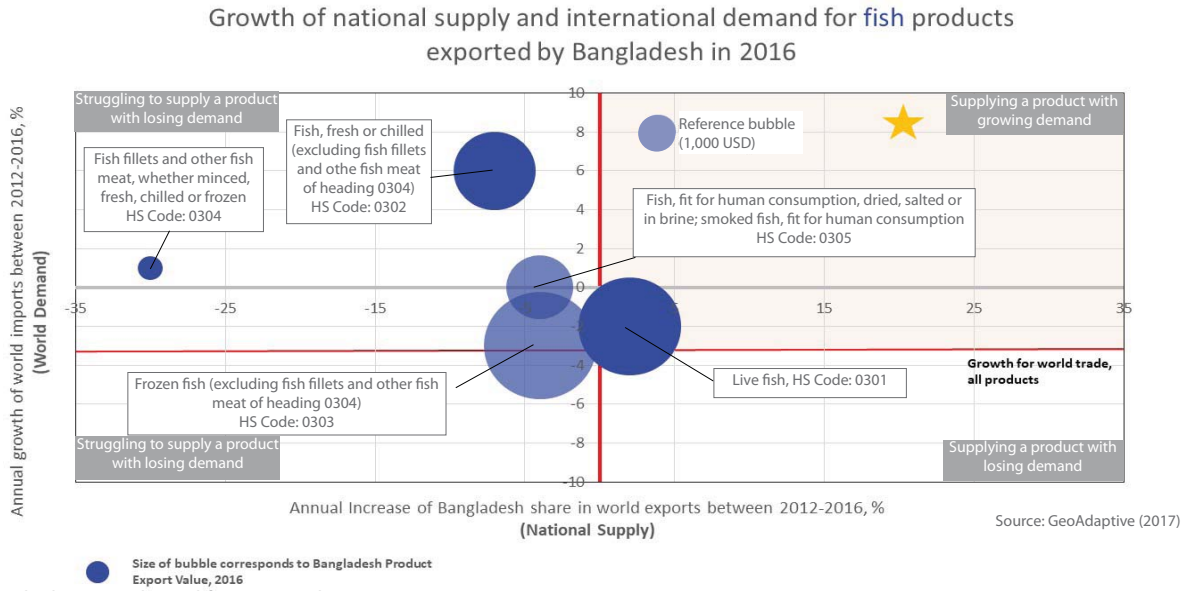


Figure 8. Trade dynamics derived from ITC Trade Map Data

## Domestic Consumption

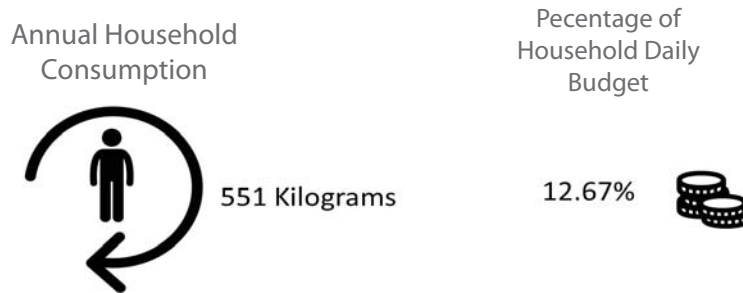


Figure 9. Consumption and Expenditure, Integrated Household and Expenditure Survey 2010

## Production

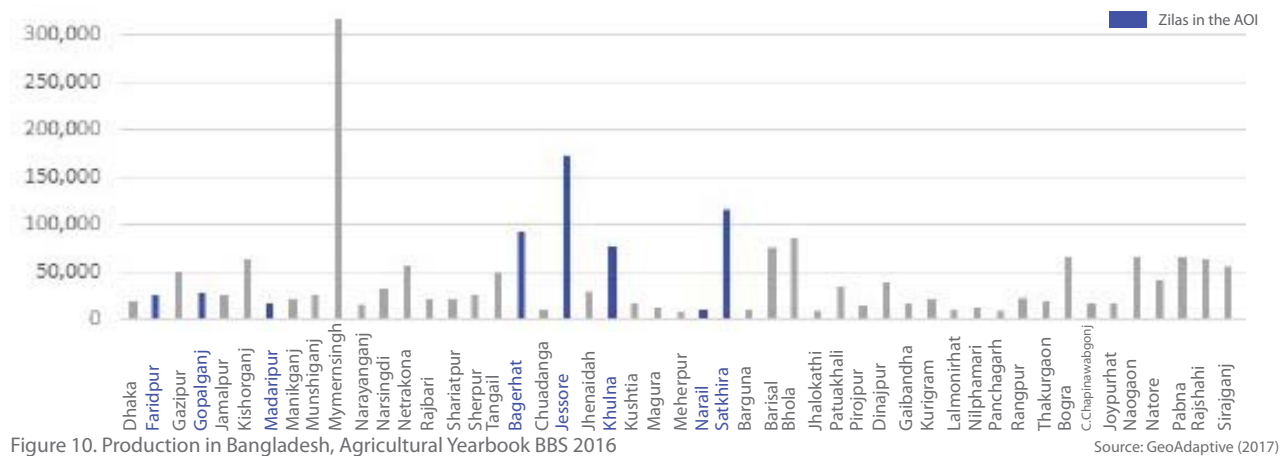


Figure 10. Production in Bangladesh, Agricultural Yearbook BBS 2016

## 1. 3. Product Characterization

---

### 1. 3.3 Floriculture

In recent years, the production of flowers in Bangladesh has dramatically decreased as evidenced by a 50% decrease in market share over the course of 4 years (2012-2016). In a study about enhancing trade in southwestern Bangladesh, the USAID reported that flowers need to be transported by land to urban centers in order to reach a link in the air freight network. As a sector, cut flowers experienced a contraction in its worldwide import growth over the same time period.

Despite a decrease in export growth for cut flowers, domestic demand in Bangladesh for flowers continues to increase, keeping pace with the country's GDP growth. Sales of cut flowers in the country have grown from 3.23 million in the 1990's to 259 million in 2015. Evidence for the continued growth of the center can be found in the increasing production of flowers, in 2013, total production of flowers was approximately 4,000 tons, in 2016 cut flower production reached over 29,000 tons.

Used in weddings and birthdays, Figure 12 identifies all the major holidays in which flowers demand spikes, with some residents in Dhaka spending a total of about 63 Takas (\$.78) over the course of a year in flower purchases.

## Trade Characterization

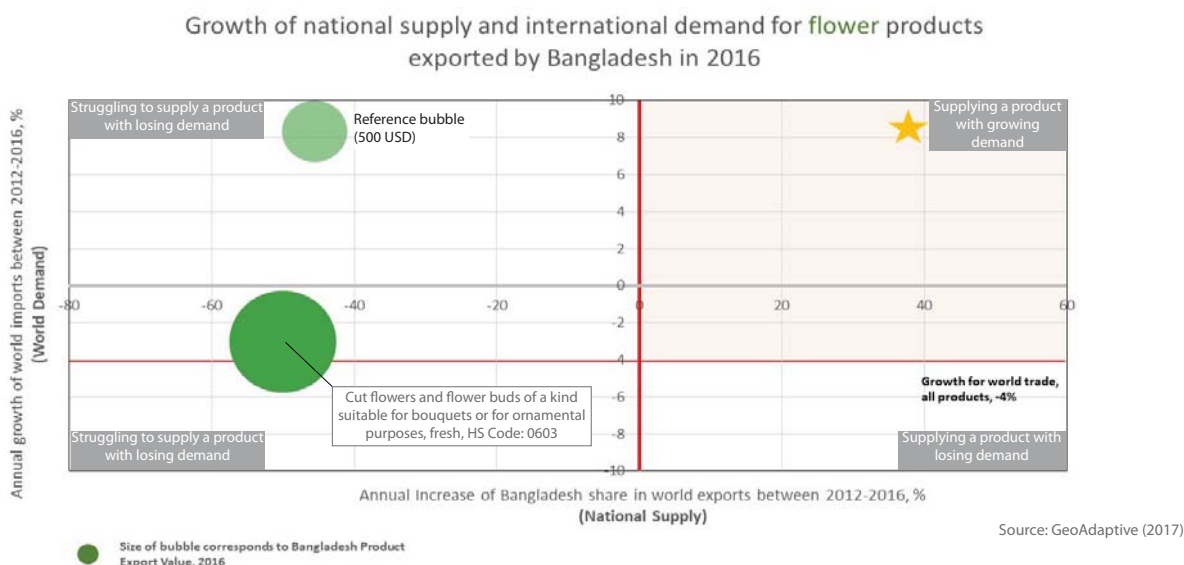


Figure 11. Trade dynamics derived from ITC Trade Map Data

## Domestic Consumption

Flowers Consumption Occurs on these Holidays



Name of Holiday*	Date
Falguni Utshab	February 13
Valentines Day	February 14
International Mothers Language Day	February 21
Independence Day	March 26
Friendship Day	1st Sunday of August
National Mourning Day	August 15
Victory Day	December 16

\*: In addition to marriage ceremonies and birthday celebrations

Annual Per Capita Expenditure on Flowers in Dhaka

TK 60 (0.78\$)



Source: GeoAdaptive (2017)

Figure 12. Consumption and Expenditure, Integrated Household and Expenditure Survey 2010

## Production

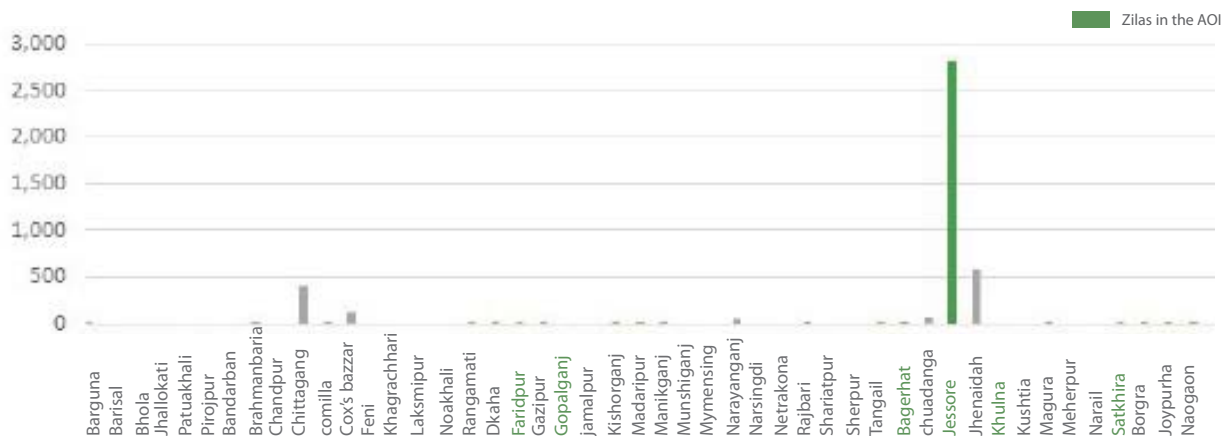


Figure 13. Production in Bangladesh, Agricultural Yearbook BBS 2016

Source: GeoAdaptive (2017)

## 1. 3. Product Characterization

---

### 1. 3.4 Livestock - Poultry

Although poultry was not selected as a final product because of its overlap characteristics with dairy products, this section includes characteristics of poultry as a reference.

Bangladesh in 2016 exported one product derived from poultry: meat and edible offal. Global imports, although decreasing, are doing better than the world average for all products; however Bangladesh's annual share in world exports has decreased by 12% over the course of 4 years (2012-2016), indicating difficulties for fowl meat exporters.

Domestic household consumption for poultry is about 204 kilograms per year, with 4.9% of household income going directly to poultry. Examining the balance of trade for poultry, the country has a trade deficit in both live poultry and poultry meat imports.

From Figure 16, it is evident that livestock production is concentrated in northern Bangladesh, primarily in the districts of Mymensingh, Naogaon, Dinajpur and Bogra. Fowl production in Bangladesh follows a similar pattern to that of cattle. In the AOI fowl production is primarily located in Jessore.

## Trade Characterization

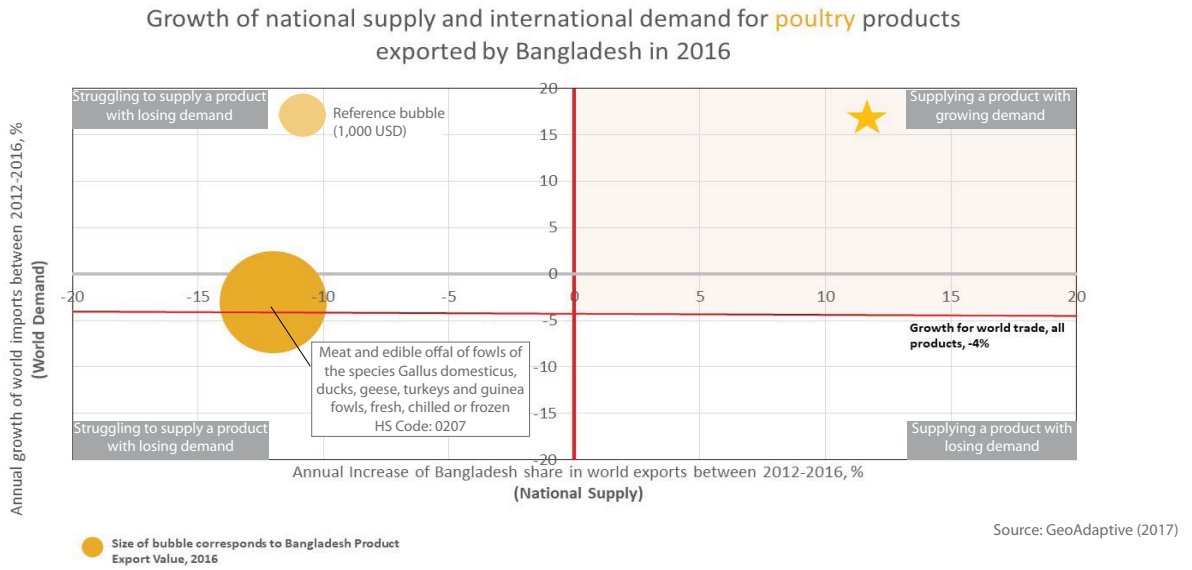


Figure 14. Trade dynamics derived from ITC Trade Map Data

## Domestic Consumption

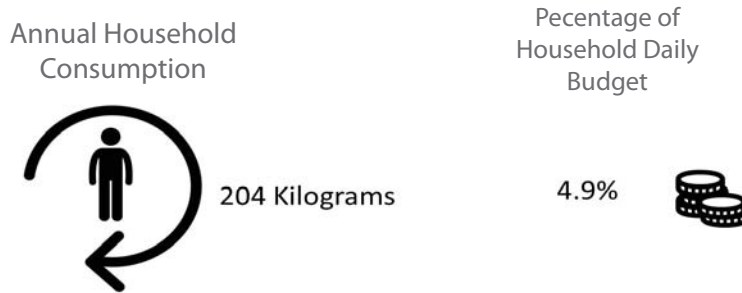


Figure 15. Consumption and Expenditure, Integrated Household and Expenditure Survey 2010

## Production

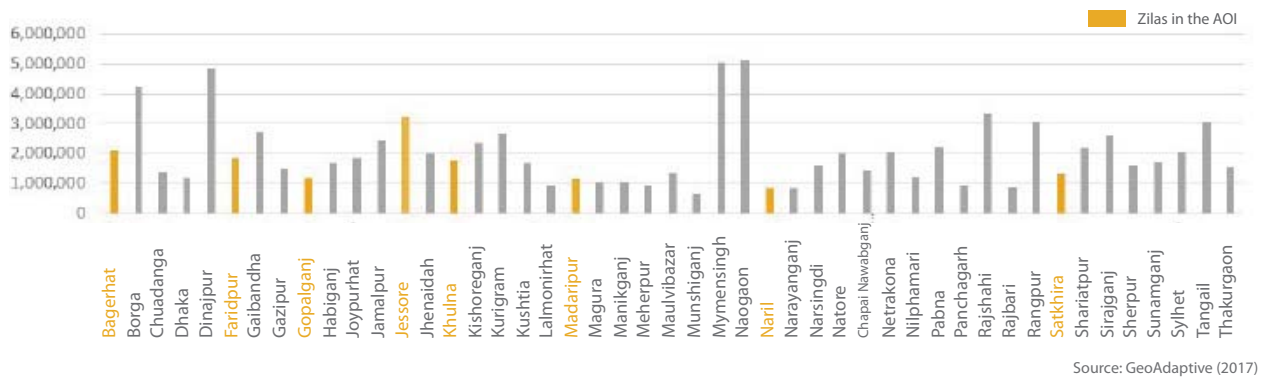


Figure 16. Production in Bangladesh, Agricultural Yearbook BBS 2016





# Chapter 2

---

## Sociodemographic and Labor Force Analysis

---

# Geospatial Profiling

---



Image by GeoAdaptive

## BACKGROUND

Bangladesh has shown stable economic growth in recent years, despite external and internal challenges. It has maintained a growth rate of 6.0% since 2010. Although the service sector makes up 56.3% of the GDP (2016), about 53.02% of the employed population is economically active in the agriculture sector.

Given that women make up over 50% of the population in Bangladesh (2016), the economic participation of women is a necessary part of the country's development. However, the level of women's labor force participation remains low (34.8% in 2017), while men's participation is about 81.9%\*. The principal barriers excluding women from participating in the mainstream economy include traditional social structures and values, limitations of the current policy framework, lack of institutional support, poor implementation of current policies, and the lack of a women-friendly sociocultural and economic environment.

While the country has rapidly progressed in infrastructure development and a variety of transport is more widely available, transportation infrastructure is still limited; about 9.5% of roads (2,021 km out of 21,269 km) in Bangladesh are paved.

## METHODOLOGY

In light of the goals of the research, this report has been designed to illustrate the available support services as well as their impact and the effectiveness of women's entrepreneurship in the AOI. To this end, geostatistical analyses have been developed. The analyses are based largely on secondary data from published sources including the websites of the Bangladesh Government and Bangladesh Bureau of Statistics. Other qualitative secondary sources were collected by consulting local clients, and publications of research and white papers from development agencies.

## OBJECTIVES

This section presents the results of the thematic mapping of the region using data and policy papers that have been collected, organized and integrated into the research team's global database. This preliminary overview seeks to assess the current conditions in the AOI, as well as the policy responses that have been generated by the state to meet the challenges and opportunities that are unique to women-driven SMEs.

With the use of a geographical information system, the team has cartographically represented systems that relate to Bangladesh's demographic, infrastructure, and socioeconomic conditions. Results in this section serve two purposes:

- To identify the underlying spatial patterns of sociodemographic and infrastructure conditions in order to understand the implications on the country's current and future productive potential
- To assess the distribution of each component and then to conduct a spatio-temporal analysis that identifies areas with limited transportation infrastructure and mobility at the upazila level

The following systems in Bangladesh are explored in this section:

- Demographics
- Infrastructure
- Social conditions
- Economic conditions
- Women-driven socioeconomic conditions
- Multisectoral assessments

---

\* Statistics based on the International Labour Organization [ILO] estimates. Labor force participation rate is measured as a percentage of male (or female) population ages from 15 to 64

## 2.1. Demographics

The AOI is located in southwestern Bangladesh, bordering the state of Bengal in India and including the Dhaka-Benapole corridor. It is administratively separated into 2 divisions (Dhaka and Khulna) which have total area of 8760.7 sq.km (5.3% of Bangladesh) with 6,821,693 people (5.3 % of total population) (BBS, 2011). The divisions are further divided into 8 zilas and 26 upazilas including Khulna Sadar which has the second highest population density in Bangladesh.

### 2.1.1 Population Distribution and Density

Understanding the distribution of population and its density is important because it explains the distribution of economic activities and access to public goods. According to BBS 2011, while the largest numbers of people reside in Jessore Sadar (742,898), Khulna Sadar appears to be the most densely populated region (9,917.3/sq.km) in the AOI:

Rank	Population		Population density	
	Upazila	#	Upazila	#/sq.km
1	Jessore Sadar	742,898	Khulna Sadar	9,917.3
2	Satkhira Sadar	460,892	Rupsha	1,748.0
3	Gopalganj	344,008	Jessore Sadar	1,468.8
4	Sarsha	341,328	Bhanga	1,070.9
5	Shibchar	318,220	Satkhira Sadar	1,067.9

Table 4. Rank of population and population density in AOI

Through analysis of the latest population distribution data from WorldPop (2015), the greatest concentration of inhabitants can be found along the national highway networks (N7), along the trade and transport corridors that link routes to Dhaka.

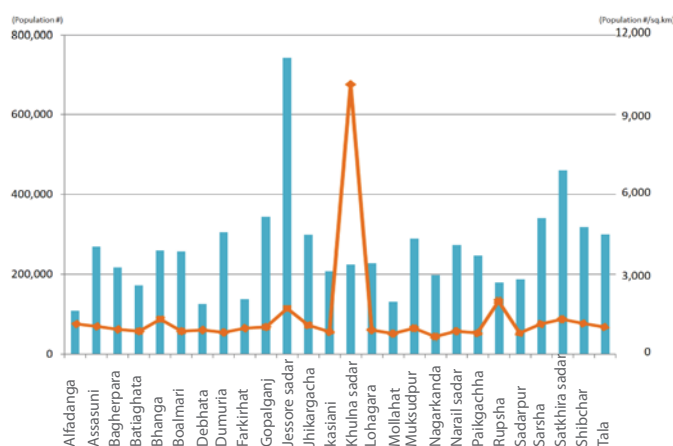


Figure 17. Total population and population density by upazila (2011)  
Source: GeoAdaptive (2017)

### 2.1.2 Urban and Rural Population and its Change

Bangladesh defines urban areas as “areas that cover city corporations, paurashavas, upazila headquarters and cantonment areas”, and about 23.0% of Bengalis live in urban areas (BBS, 2011). Unlike the global trend where rural populations are decreasing, people living in rural areas of Bangladesh have consistently grown by 1.03% from 2001 to 2011.

The AOI is characterized by a higher rural population than the national average (76.7%), while 15.8% of people are in urban areas. At the upazila level, all people in Khulna Sadar are considered to be living in an urban area, followed by somewhat higher rural populations in Jessore (34.1%) and Satkhira (24.6%). The highest rural population compositions are observed in Rupsha (100%), Kasiani (97.4%), and Sadarpur (96.7%), while 20 out of 26 upazilas in the AOI have rural populations of more than 80%.

Khulna Sadar is of particular interest because it is the densest and most urbanized area but is experiencing the highest decrease in population density (-1,157.9/sq.km) from 2001 to 2011. While the gender ratio has remained steady from 2001 to 2011, the number of women has increased from 46.6% to 48.5%. This is assumed to reflect a trend of outmigration to surrounding areas in Khulna Sadar.

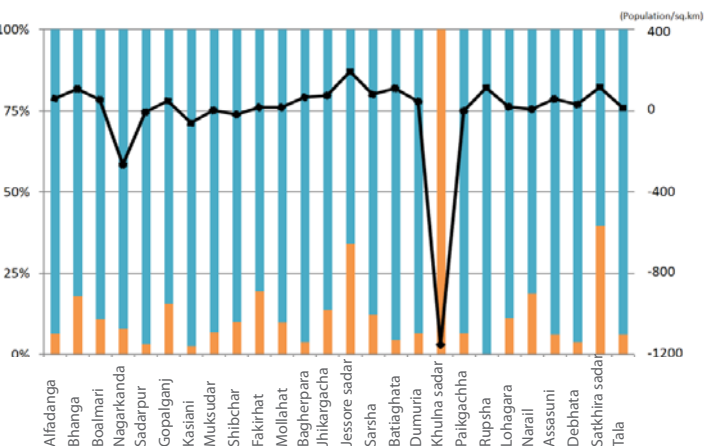
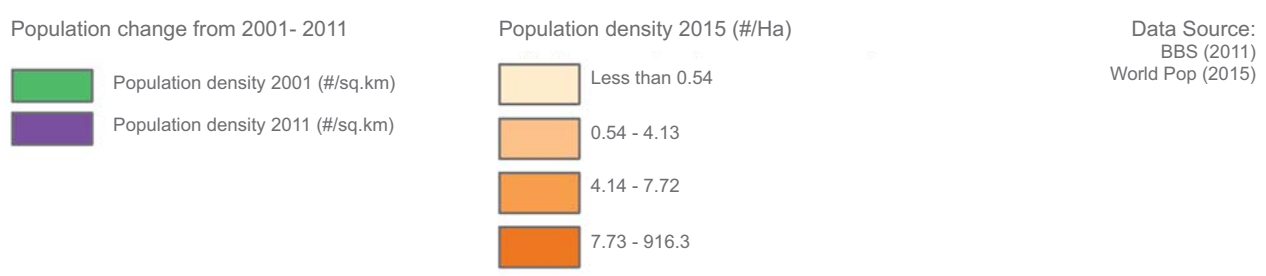
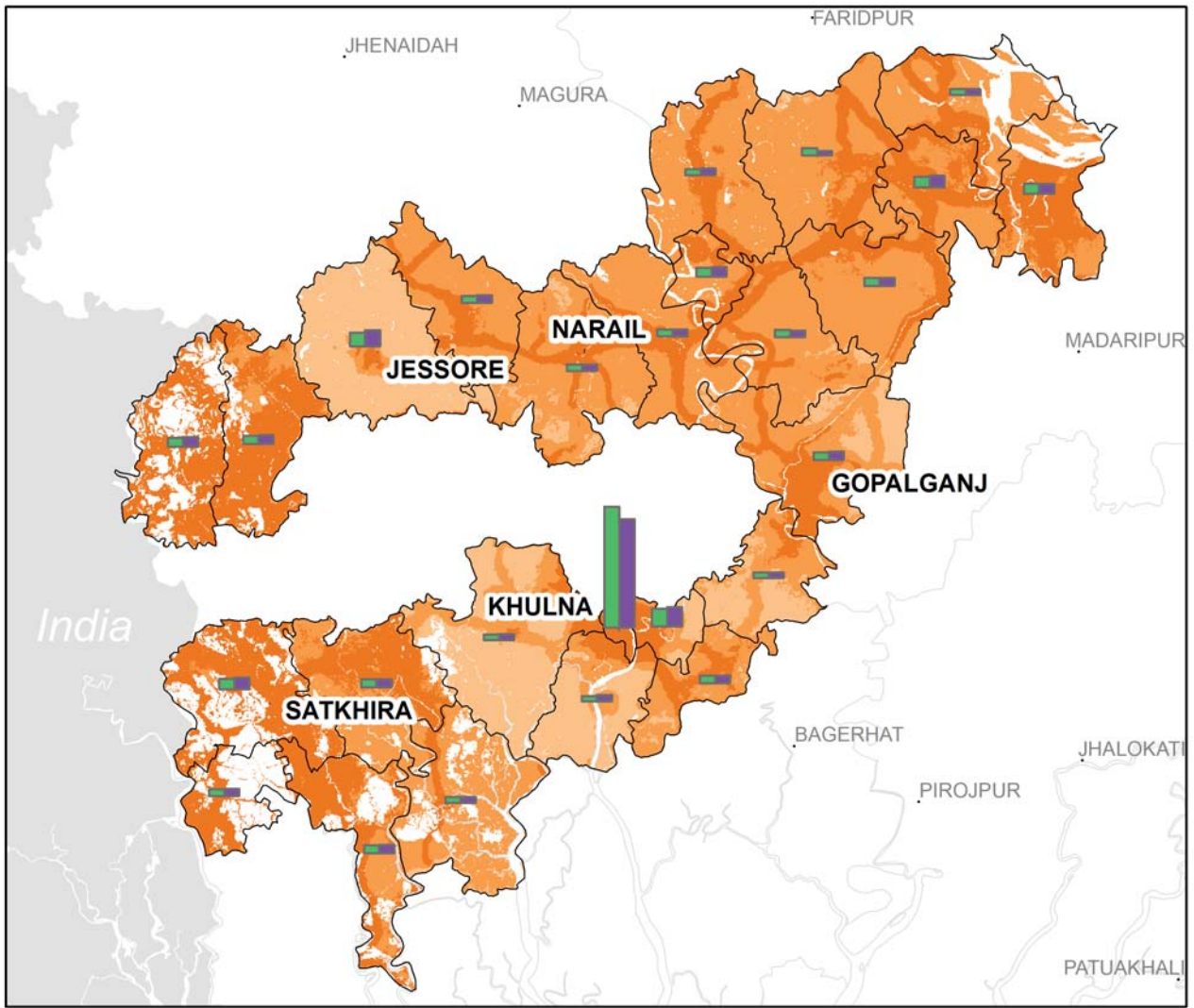


Figure 18. Urban and rural composition by upazilas in AOI. The line describes population density changes from 2001 to 2011 (2011)  
Source: GeoAdaptive (2017)



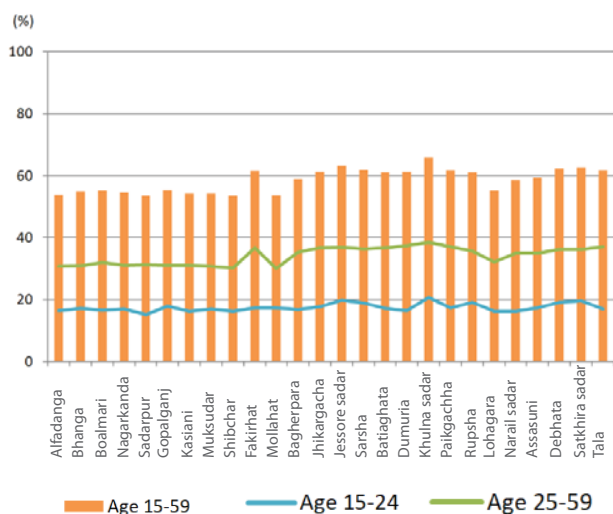
Map and analysis created by GeoAdaptive (2017)

Figure 19. Distribution of population density and population (2015) and population density changes from 2001 to 2011. Higher population density is distributed where national/regional highways are located. Highest population density is observed in Khulna Sadar; however, it has experienced the highest population decrease from 2001 to 2011

### 2.1.3 Work Force and Gender Distribution

In Bangladesh, 58.9% of the total population is working age (15 to 59). Likewise, 58.9% of the AOI population is working age, including 41.3% of the population in the 25-59 age range that is active in the labor force. The highest density of labor force population is found closer to the border with India including Khulna, Jessore, and Satkhira Sadar. Furthermore, the AOI includes 32.6% of 10-14 age range, compared to the national age range of 28.27%, which has the potential to further increase the work force in 5 years.

The number of men and women in the AOI is roughly equal, though women hold a slight lead with 107 women to 100 men. This represents a higher female ratio than the national level with 101 women for 100 men. Unlike labor force distribution, higher female ratio areas are concentrated in the central to northern parts of the AOI, including upazilas such as Alfadanga (1:1.09), Lohagara (1:1.08), Kashiani (1:1.07), Sadarpur (1:1.07) and Bhanga (1:1.06), although the standard deviation is 0.03, indicating the ratio is clustered closely around the mean.



Source: GeoAdaptive (2017)

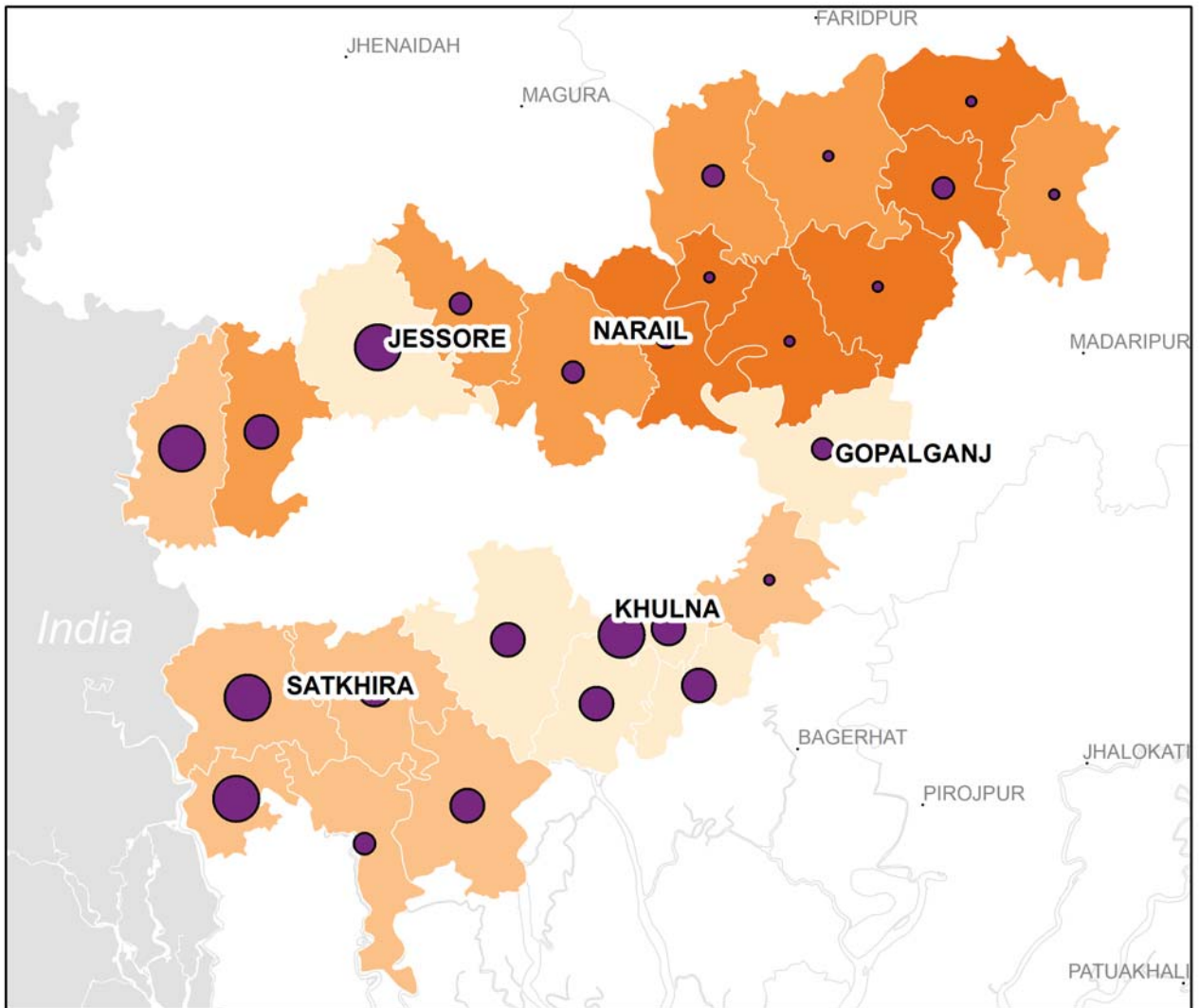
Figure 20. % of working age population by upazila

Table 5 provides a proxy that the AOI includes a higher proportion of men in the work force, based on the gender ratio compared with overall work force per age group. Areas with more people in the workforce had a lower female-to-male ratio. Specific data on the gender composition of the workforce were not available at the upazila level.

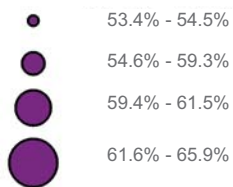
	Female Ratio	Age 15-59	Age 15-24	Age 25-59
Female Ratio	1			
Age 15-59	-.75	1		
Age 15-24	-.69	.72	1	
Age 25-59	-.69	.98	.55	1

Source: GeoAdaptive (2017)

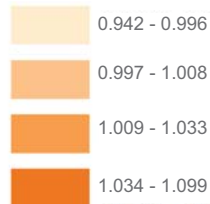
Table 5. Correlation between workforce and female-to-male ratio in AOI



% of labor force (age 15-59)



Female-to-male ratio



Data Source:  
BBS (2011)

Map and analysis created by GeoAdaptive (2017)

Figure 21. Distribution of female-to-male ratio and work force by upazila. Unlike labor force distribution, a higher proportion of women are observed in the northern part of the AOI. This provides a proxy that the AOI includes a higher proportion of men in the work force

## 2.2. Infrastructure

### 2.2.1 Road and Public Transportation

The road network of Bangladesh plays a major role in mobility considering that more than 80% of the population use it as their main form of transport. This results in higher levels of connectivity in urban areas, yet the rural road network across the country needs maintenance and repair. This generates conditions of rural inaccessibility, for example, to 76.7% of the population in the AOI.

Likewise in the AOI, within the 15,752 km of roads, there is a marginal network of paved roads (35.6%), which leaves most of the territory with unpaved roads (64.4%). As shown in Figure 22, 12 out of 26 upazilas have a higher proportion of unpaved roads compared to the national level, which contributes to its inaccessibility. Surprisingly, major sadars, such as Jessore and Satkhira, are found to have a greater length of unpaved roads.

Also, the road sector not only provides point-to-point transport but also connects with all other modes of transport, such as railways, airports, and water transportation, as shown in Figure 23. In particular, many agricultural crops are transported to Dhaka by water because prices are cheaper. However, public transportation is clustered in major upazilas, which limits accessibility to rural populations.

Road type	Length (km)
National highways	443.2
Regional highways	119.6
Zila roads	343.7
Upazila roads	2,506.1
Village roads A	5,080.9
Union roads	2,145.8

Table 6. Summary of road network in AOI Source: GeoAdaptive (2017)

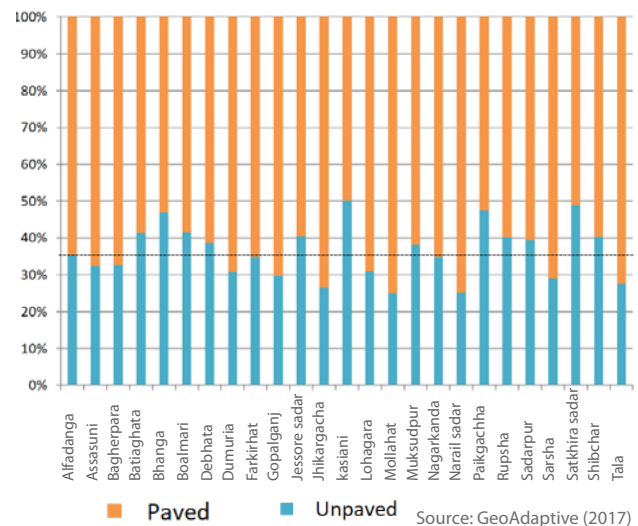


Figure 22. Composition of paved and unpaved roads in AOI Source: GeoAdaptive (2017)

#### Box 3. Challenge to Identify Speed Limits for Infrastructure Accessibility Analysis

Accessibility analysis is considered an appropriate way to assess interactions between transportation and land use. As an accessibility indicator, travel time is often considered to be an intuitive measure that corresponds with people's perception. Traditionally, travel time has been calculated using a cost attribute that stores the time it takes a vehicle to traverse street segments (e.g. speed limit of the road segment and its length).

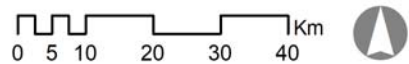
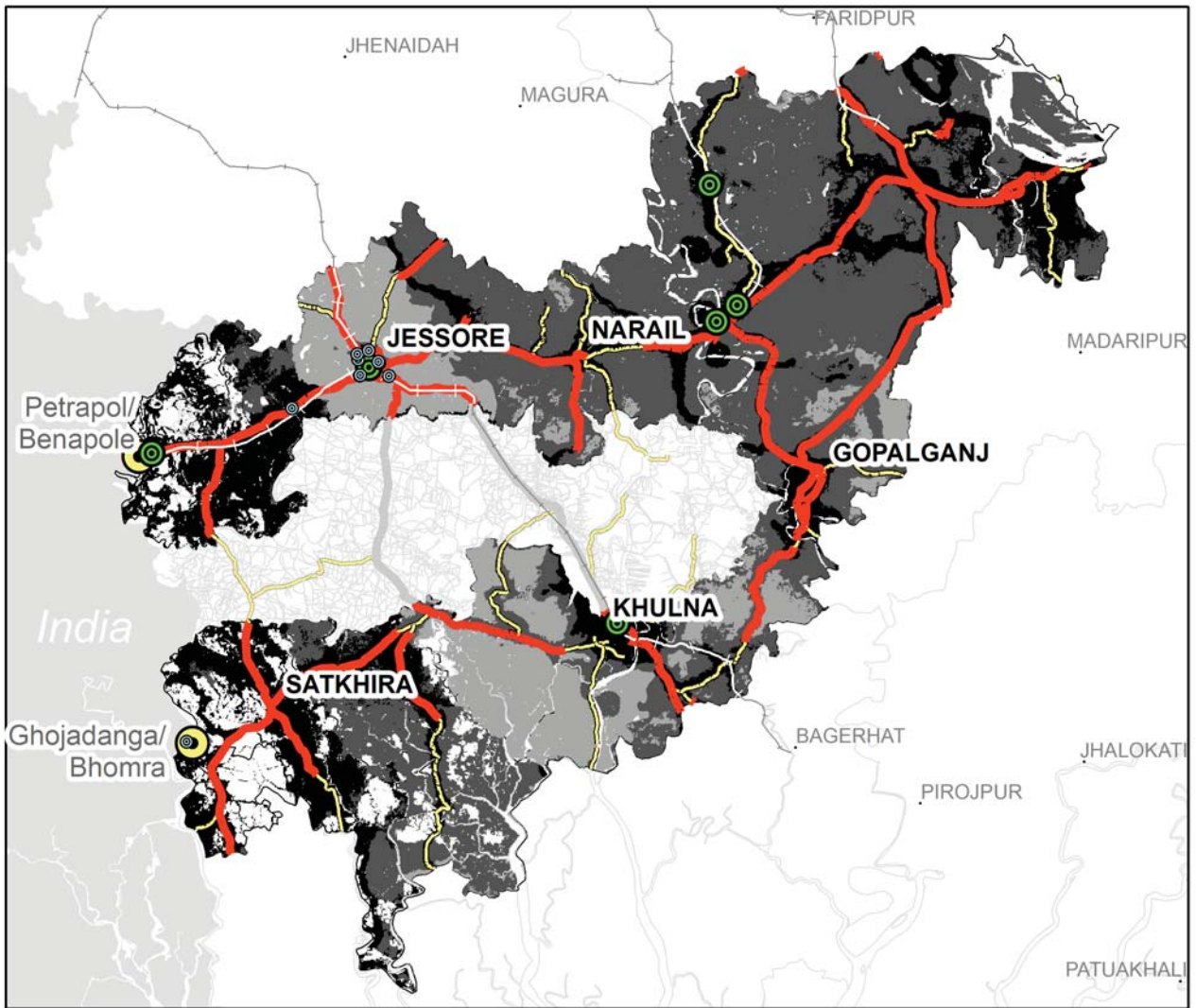
Due to the lack of updated published data regarding speed limit for road segments, the research team created a proxy from estimating real-time traffic data. Below are the speed limit proxies for each road type:

Road Type	Estimated Speed Limit (KMPH)
National Highway	60
Regional Highway	50
Zila Road	30

Road Type	Estimated Speed Limit (KMPH)
Upazila Road	20
Union Road	20
Village A and B Road	20

Source: GeoAdaptive (2017)





Type	Number or length
Transit hubs	6
Rail network	155.7 km
Bus stations	10
Airports	1: Jessore airport

- National/Regional Highway
- Zila Roads
- Railway
- Bus Stations
- Transit Hubs

- Population density 2015 (#/Ha)
- Less than 0.54
  - 0.55 - 4.13
  - 4.14 - 7.72
  - 7.73 - 916.3

Data Source:  
 LGED (2014)  
 OSM (2016)  
 World Pop (2015)

Table 7 Summary of public transportation infrastructure

Map and analysis created by GeoAdaptive (2017)

Figure 23. Distribution of population density and transportation infrastructure. Road network and public transportation infrastructure have good interconnectivity. However, public transportation is clustered in major upazilas, which limits its accessibility to the rural population

## 2.2.2 Electricity

There are extreme cases of unequal electricity access in households across upazilas in the region. For example, as shown in Figure 24, upazilas around urban areas report high coverage (Khulna Sadar - 94.7%, Rupsha - 75.8%, Jessore Sadar- 75.2%), while the Assasuni has a rate of coverage of only 30.7%. Broadly speaking, the poorest quantile of the household has a 40% coverage rate, while the wealthiest quantile has almost universal coverage. Represented in the map in Figure 26, existing power plants and electricity transmission lines are concentrated in Khulna Sadar and neighboring upazilas (Rupsha and Dumuria), Jessore Sadar, and Satkhira Sadar.

Additionally, as shown in Figure 25, a negative relationship is identified between households without sanitation and with electricity. This indicates if households suffer from limited electricity service, they also tend to lack sanitation, which consequently leads to public health problems and low productivity. Especially in the AOI, upazilas with high agricultural employment rates (e.g. Assasuni in Satkhira zila) have low electricity and sanitation coverage in their households, which can affect the expansion of the labor force.

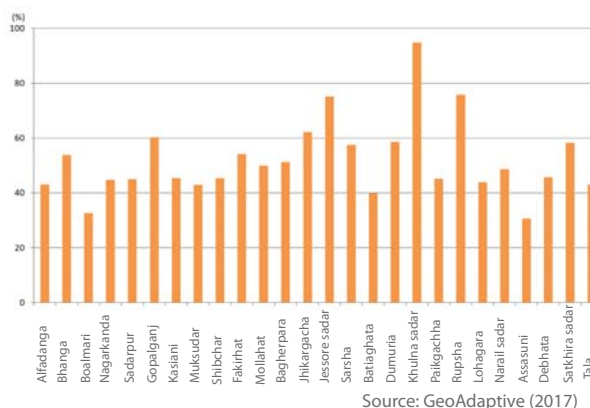


Figure 24. % of household with electricity by upazila

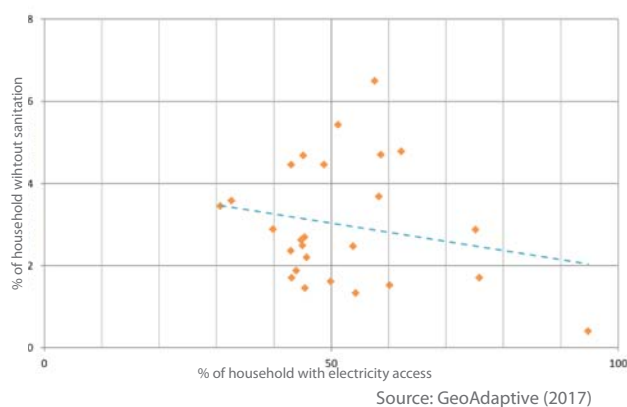
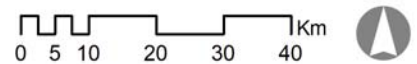
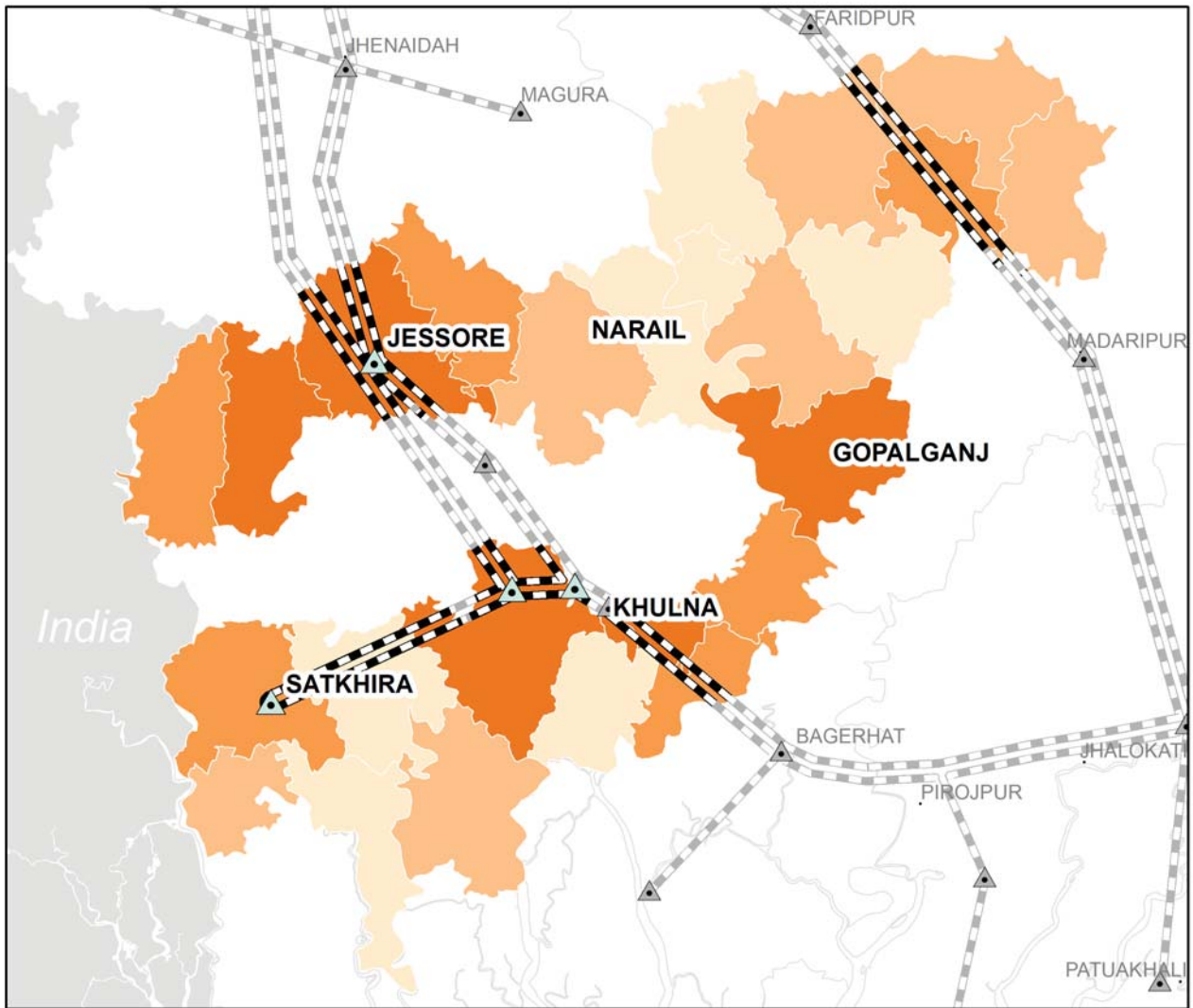


Figure 25. Correlation between % of household with electricity access and household without sanitation



- Power plant
- Electricity line
- % of households with electricity
  - 30.7% - 43.9%
  - 44.0% - 48.7%
  - 48.8% - 58.3%
  - 58.4% - 94.7%

Data Source:  
BBS (2011)  
NREL (2007, 2013)

Map and analysis created by GeoAdaptive (2017)

Figure 26. Distribution of households with electricity and location of power plants and electricity transmission lines. Upazilas with a high percentage of households with electricity are observed in Jessore zila and Khulna Sadar and neighboring upazilas, where power plants and electricity transmission lines are concentrated. Bagerhat zila and neighboring upazilas in Gopalganj zila also show higher electricity accessibility

## 2.3. Social Conditions

### 2.3.1 Education Access

The education system in Bangladesh has three levels:

- 1) Primary (years 1-8, Ages 6-10): Free for children and covers from grades one through five
- 2) Secondary (Years 9-12, Ages 11-17): May specialize in humanities, science or commerce
- 3) Tertiary

Government expenditure on public education was 2.5% of GDP in 2016<sup>1</sup>, which is lower than the global average of education spending which is 4.4%.

In 2001, two-thirds of students were enrolled in government primary schools. Non-governmental institutions are particularly active in the delivery of primary education to the most economically disadvantaged children in Bangladesh. One of the largest non-governmental organizations involved in primary education in Bangladesh is BRAC. Through the year 2000, BRAC schools enrolled 1.3 million children in total.

Following the objectives of this project, which are to develop economic opportunities, especially for women entrepreneurs, this section considers the current provision of primary education and explores the spatial distribution of potential skill sets derived from primary education.

<sup>1</sup> Retrieved from <https://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS?locations=BD>

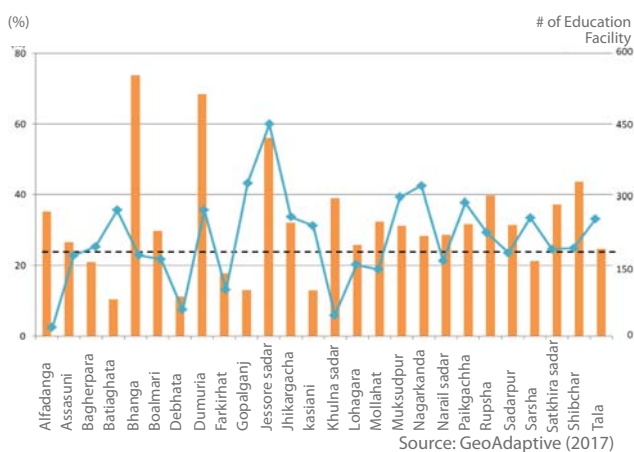


Figure 27. % of population without any education and number of education facilities by upazila

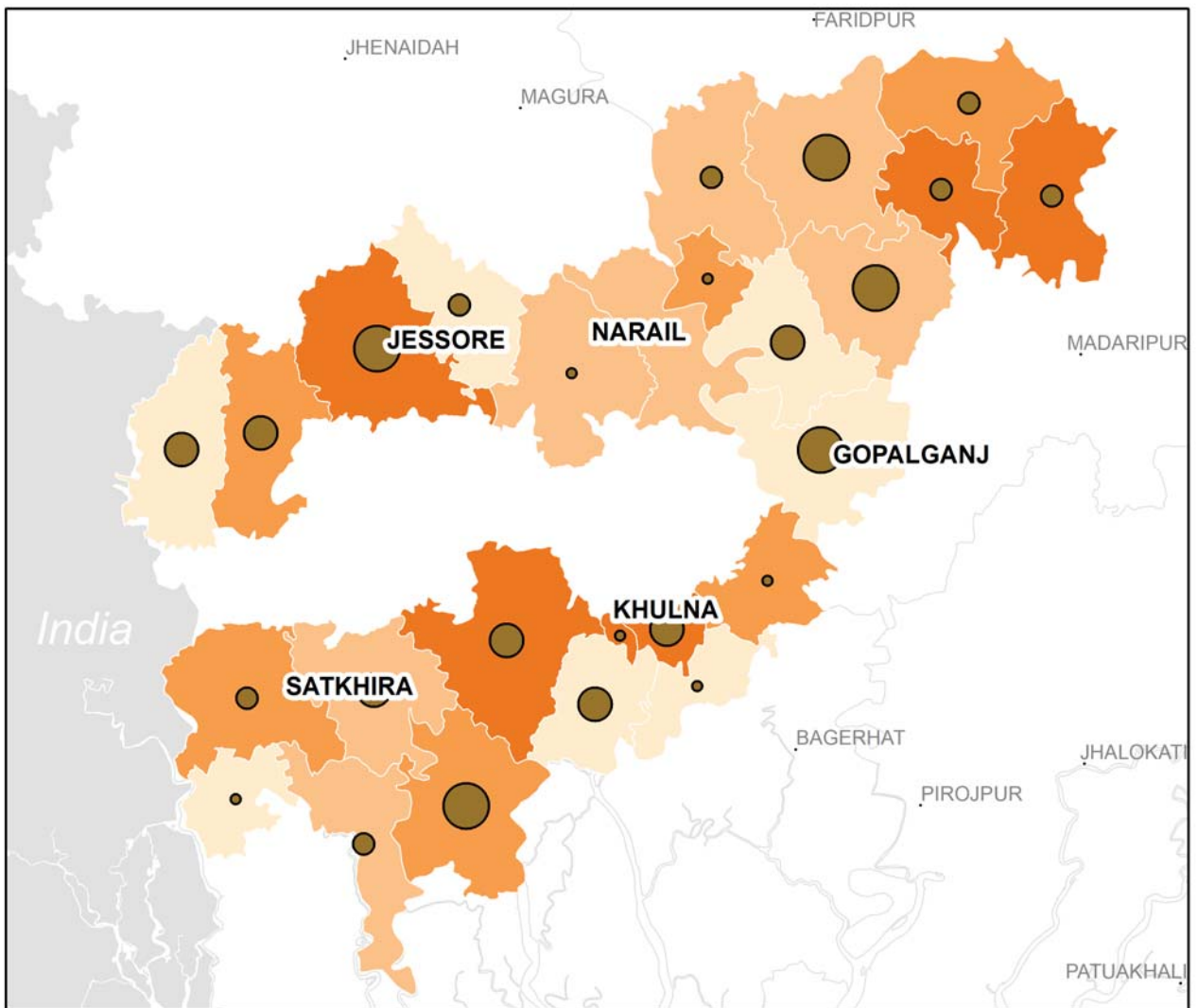
The BBS Census 2011, estimates that about 24.2% of population (1,650,389) never attained any level of education offered. Upazilas with the highest percentage of uneducated people are: Bhangha (73.7%) in Dhaka division and sadars such as Jessore (56.0%), Khulna (38.9%) and its neighbor Rupsha (39.7%), and Satkhira (37.4%), while these upazilas have about 20.1% (1,148 out of 5,714) education facilities in AOI. These distributions are shown in Figures 27 and 28.

### 2.3.2 Literacy

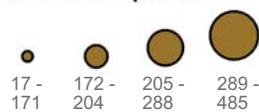
Adult (15+) literacy rate of Bangladesh has increased from 32.40% to 56.09% from 1991 to 2011. The improvements may be due to broad efforts to expand literacy and the non-formal educational programs to provide livelihood skills training.

The average literacy rate within the AOI is 54.6% (Standard deviation= 7.26), and rates for all upazilas have constantly increased from 1999 to 2011. Rural regions, such as Sadarpur (43.2%), Shibchar (43.5%), Nagarkanda (22.6%) have the lowest literacy rates in the AOI. In general terms, working children in rural areas remain one of the main groups excluded from formal education and literacy.

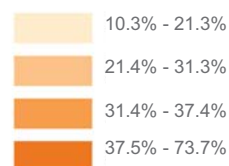
Additionally, the Sarsha upazila, along the border with India, shows the highest literacy increase (24.3%) in the AOI, during the same period.



Number of Schools by Upazila



% of Population Without Any Education



Data Source:  
BBS (2011)  
NREL (2007, 2013)

Map and analysis created by GeoAdaptive (2017)

Figure 28. % of population without any education offerings and number of schools by upazila. Upazilas with the highest percentage of uneducated people are observed in the northern part of the AOI (Bhanga upazila in Dhaka division and major sadars such as Jessore, Khulna and its neighbor Rupsha (39.7%)). However, these major sadars have about 20.1% (1,148 out of 5,714) education facilities in the AOI

### 2.3.3 Health Access

The AOI includes two types of healthcare providers including 30 hospitals and 162 family welfare centers. According to the latest LGED dataset (2017), there are a total of 30 hospitals that provide the first level of complex health care treatment. In addition to complex healthcare treatment, there are 162 family welfare centers scattered across the AOI that are responsible for all government programs relating to family planning in Bangladesh. There is at least one hospital in each upazila, except for upazilas such as Boalmari and Bagerhat, while hospitals are located along the corridors of national and regional highways.

Figure 29 summarizes the average travel time to the nearest three hospitals by upazila. Mollahat (108 minutes), Boalmari (96 minutes), Bagerhat (93 minutes) have the most limited access to hospitals. Surprisingly, despite Khulna Sadar being the most populated area in the AOI, it takes about 91 minutes to reach the nearest hospital.

Figure 31 shows the geographic distribution of the average travel time to the nearest 3 hospitals at the union level.

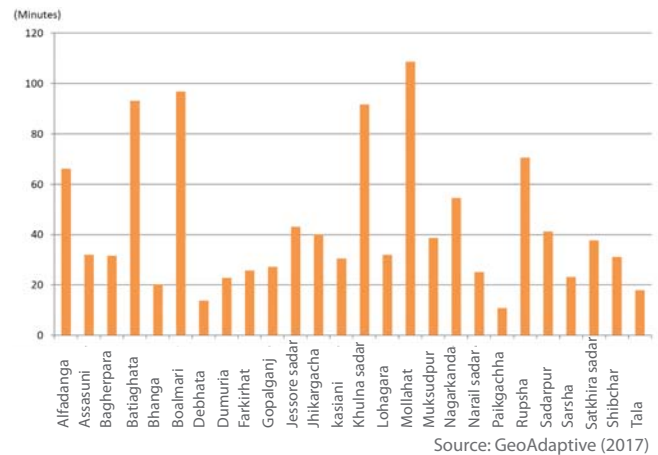


Figure 29. Average travel time to 3 nearest hospitals by upazila

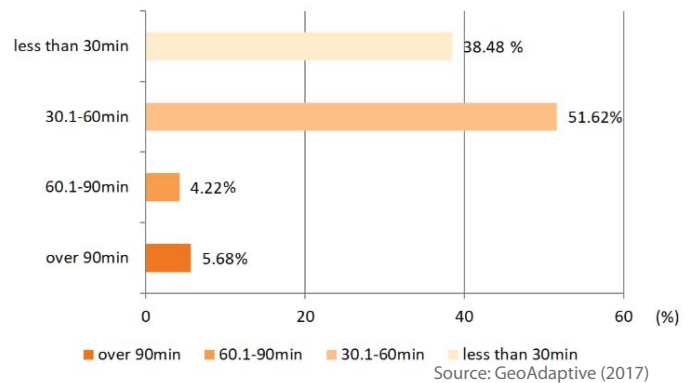
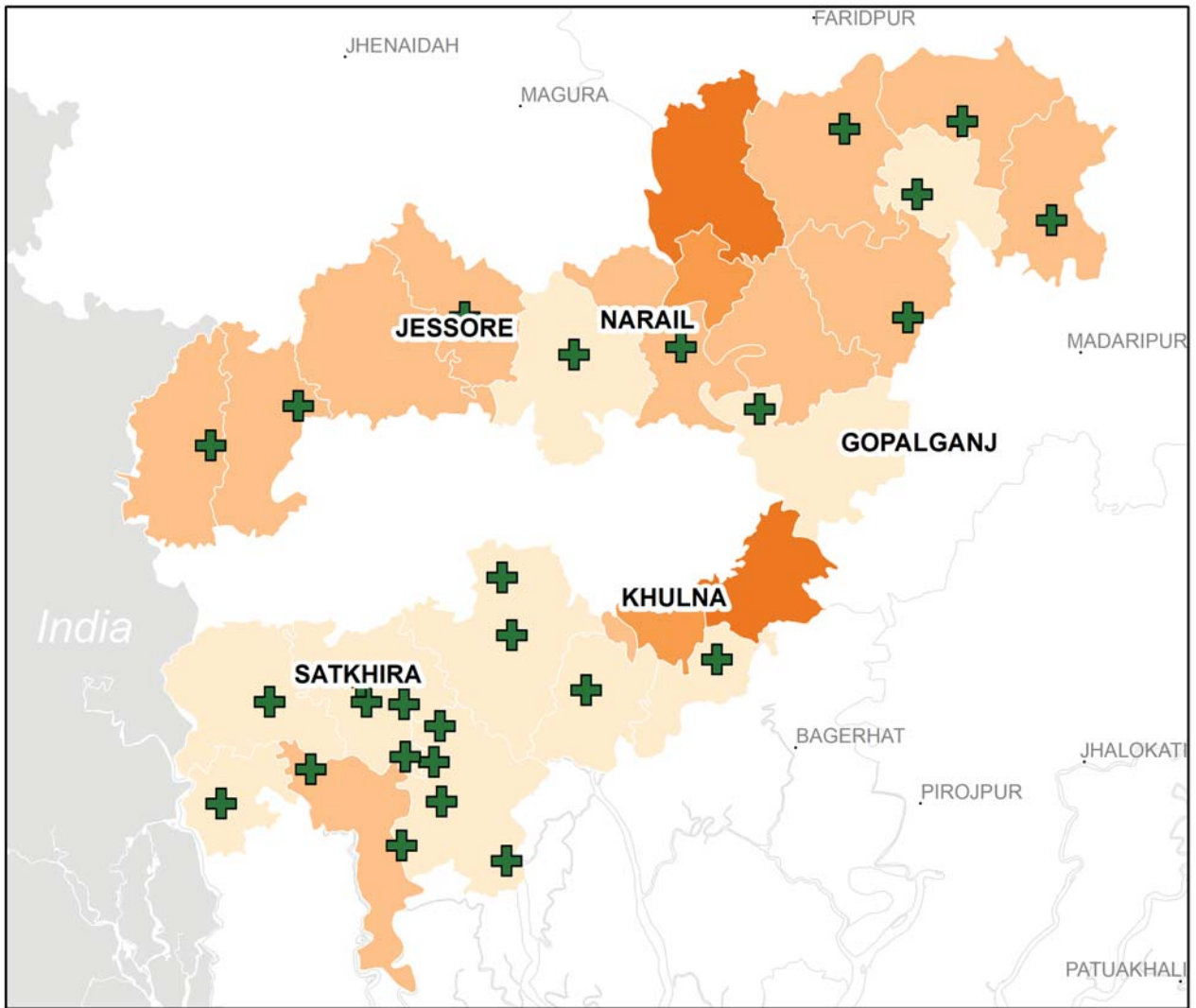
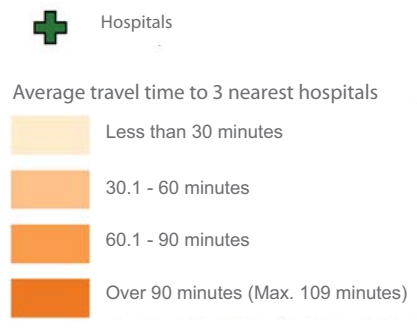


Figure 30. Percentage of population with access to the nearest 3 hospitals



Data Source:  
LGED (2017)



Map and analysis created by GeoAdaptive (2017)

Figure 31. Distribution of hospital access based on travel time to the nearest 3 hospitals. About 39% of population is less than 30 minutes away from the nearest hospitals; however, 61% of population located at the edges of each upazila tends to experience limited access to health service

## 2.4. Economic Conditions

### 2.4.1 Poverty and Income

Bangladesh has shown great progress in reducing poverty, as poverty dropped from 25.10% in 2005 to 17.60% in 2010 (BBS); while the World Bank also recorded that it fell from 49% in 2000 to 31% in 2016. Poverty reduction is not just about improving household income, but is also about enhancing human capability. Applying the latest census data from BBS Census 2011, the AOI includes a higher number of poor households compared to the national level. Upazilas with more than 40% of households living below the poverty line were dispersed across the AOI, except for major cities and nearby suburbs.

The highest percentage of poor people is observed in upazilas bordering India (Assasuni - 48.4%, Tala - 45.2%, Debhata - 43.1%). Surprisingly, Satkhira Sadar has about 43.1% of households below the poverty line among metropolitan areas in the AOI. Similar to poverty distribution, extreme poverty is also concentrated in upazilas bordering India, as well as in the Gopalganj district in Dhaka Division.

Showing the opposite pattern of poverty distribution, households with higher income were observed in the northeast of the AOI. Additionally, three upazilas (Muksudpur, Gopalganj, and Kasiani) in Gopalganj district and two upazilas (Sarsha and Jhikargacha) in Jessore district are observed to have higher income and high poverty rates that indicate that inequality needs to be addressed in these areas.

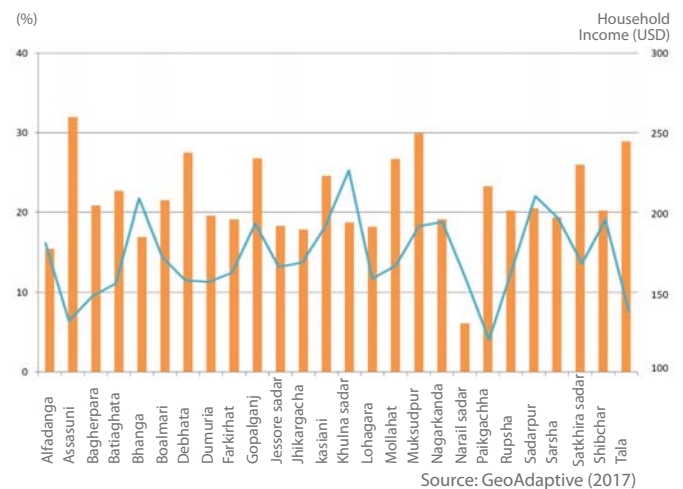
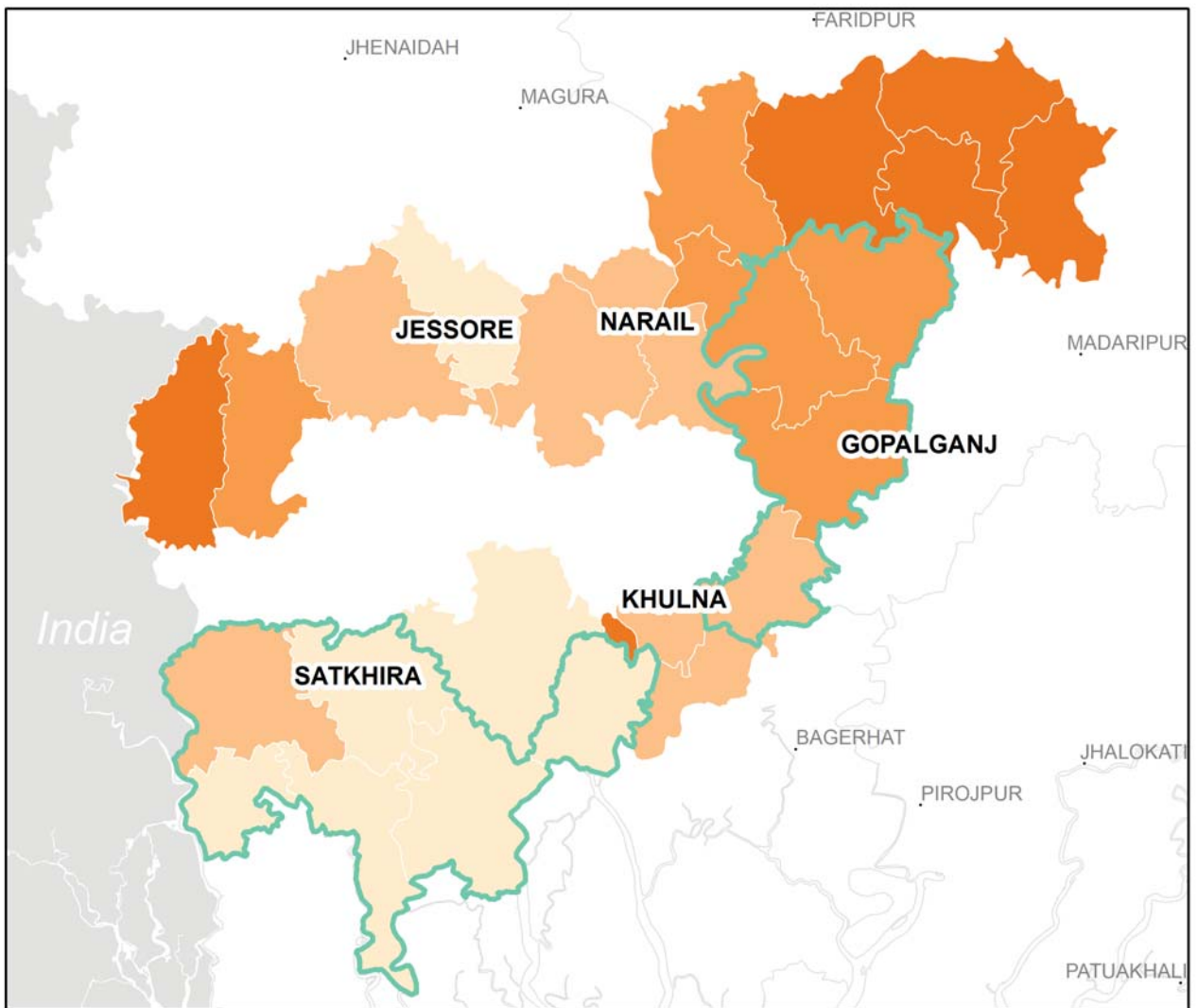


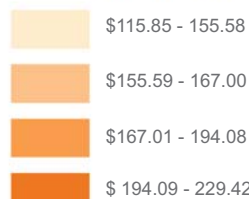
Figure 32. Percentage of population with extreme poverty and average household income (USD) distribution by upazila





Data Source:  
BBS (2011)

Mean household income (USD)



Upazilas higher than 21.5% extreme poverty

Map and analysis created by GeoAdaptive (2017)

Figure 33. Distribution of mean household income (USD) estimates per grid square (2013) and areas with high extreme poverty. Households with higher income are observed in the northeast of the AOI, showing the opposite pattern of poverty distribution. However, upazilas in Bagerhat and Gopalganj zilas are found to have higher income and high poverty rates that indicate inequality needs to be addressed in these areas

## 2.4.2 Employment

The economically active population makes up 28.7% of the total, which is slightly higher than the national level of 28.3%. The highest concentration is identified in upazilas on the India border, in addition to Khulna Sadar (33.1%) and Rupsha (32.1%).

Employment is concentrated in three sectors (agriculture, industry, and service), which helps identify urban and rural characteristics. Notably, two metro regions: 1) Khulna Sadar and Rupsha, and 2) Jessore Sadar upazilas have more than 50% of population working in service sectors, whereas other upazilas have high concentration of the workforce in the agricultural sector. Geographically, agricultural employment rates are high in two upazilas (Assasuni and Tala) in Satkhira district close to the Indian border, two upazilas (Nagarkanda and Sadarpur) in Faridpur district that are suburban upazilas of Dhaka, and Mollahat in Bagerhat district.

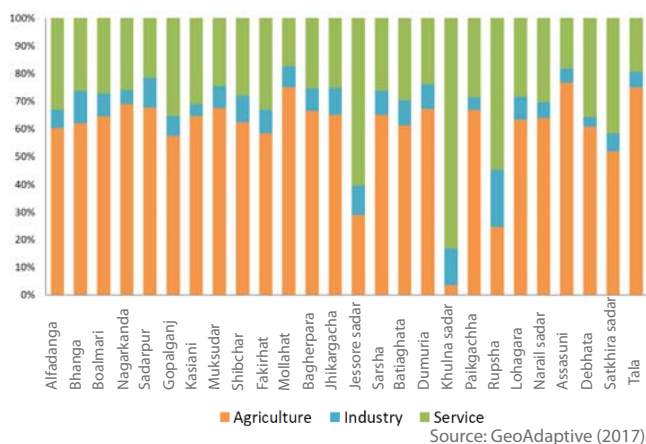


Figure. 34. Economic activity by agriculture, industry, and service sectors by upazila

## 2.4.3 SMEs

In broad terms, SMEs represent the backbone of local economies in developing countries. SMEs in Bangladesh are defined by the Ministry of Industry and the Bank of Bangladesh using employed manpower and fixed assets other than land and buildings. Criteria for the definition of a SME are given below:

### Small Enterprise

Sector	Fixed asset other than land/ building (Tk.)	Employment manpower (n)
Service	50,000- 5,000,000	25
Business	50,000- 5,000,000	25
Industrial	50,000 – 15,000,000	50

### Medium Enterprise

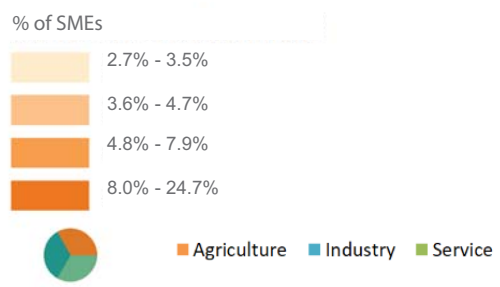
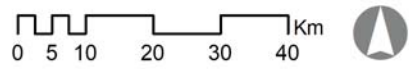
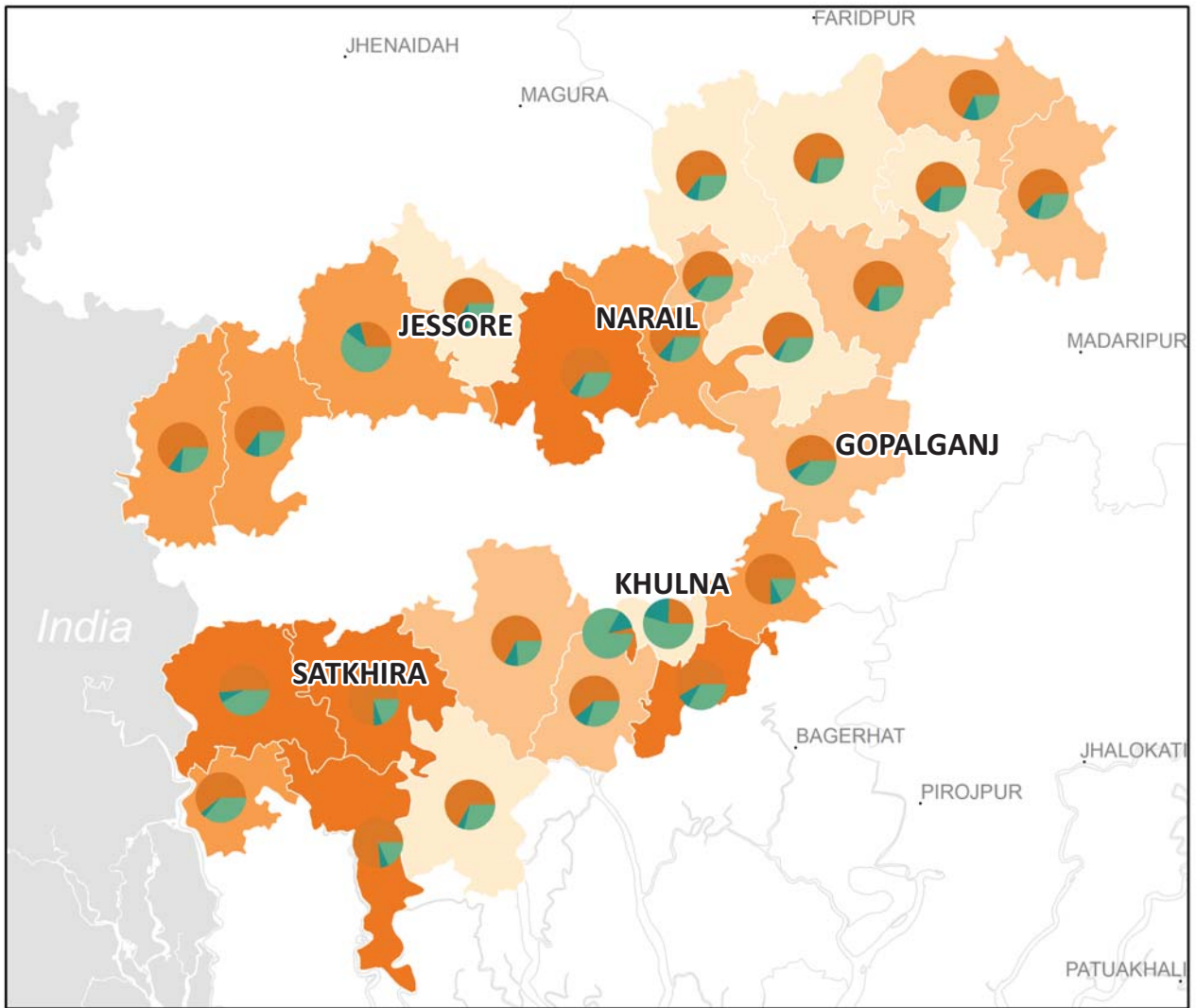
Service	5,000,000 – 100,000,000	50
Business	5,000,000 – 100,000,000	50
Industrial	15,000,000 – 200,000,000	150

Source: The Central Bank of Bangladesh (2017)

Table 8. Criteria for SMEs in Bangladesh

According to the 2011 Census, there are 32,818 SMEs which are in the AOI and represent about 8% of total SMEs in Bangladesh. SMEs have employed 271,604 in the AOI (about 4% of AOI population).

Geographically, similar to employment distribution, SMEs and the population involved in SMEs are concentrated in upazilas bordering India. However, Khulna Sadar has the highest population involved in SMEs (40.77% among economically active populations), and the highest SME rate (24.7% among total establishments).



Data Source: BBS (2011)

Map and analysis created by GeoAdaptive (2017)

Figure 35. Distribution of SMEs in the AOI and economic activity by sectors in each upazila. Except for major sadars such as Khulna and Jessore having high SME establishments and high service employment rates, upazilas with high SME establishments are economically active in agriculture

## 2.5. Women-Driven Socioeconomic Conditions

### 2.5.1 Female Employment

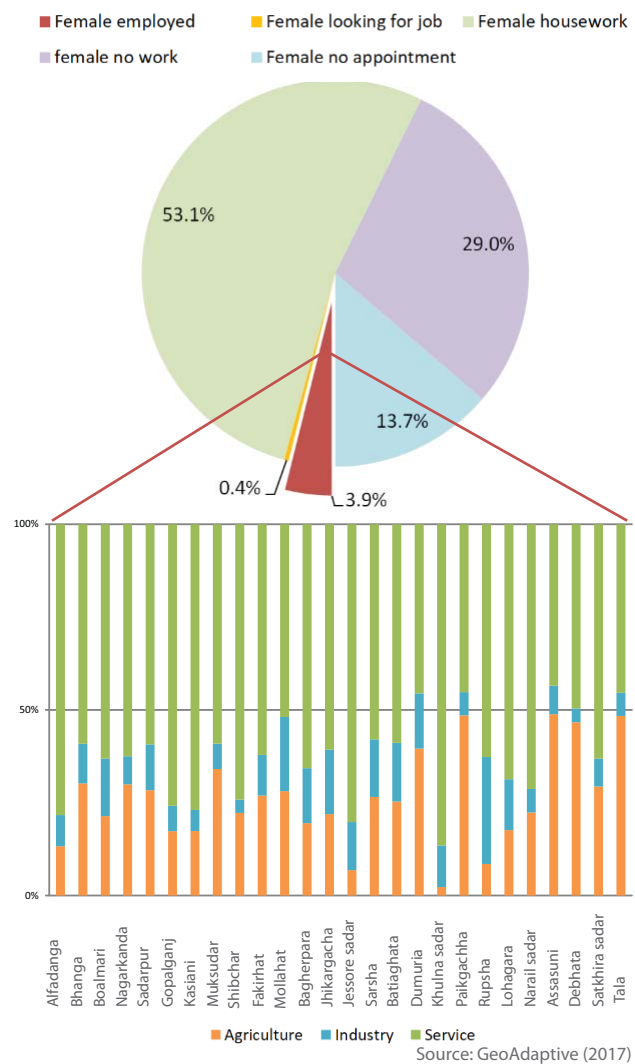
Historically, employment in Bangladesh is dominated by men, and the difference in male and female participation rates is an important feature of the labor force. According to the latest Census (BBS, 2011), the ratio between male and female employment is estimated to be 9.5:1 at the national level, showing a high disparity nationwide. Only 2.12 % (1,526,092 out of total female population) are currently employed, while 22.4% (16,132,467) are women working in the household. Among the female population who are currently employed, 47.8% are working in the service sector while 27.7% and 24.4% work in agriculture and industry, respectively.

According to the 2011 Census, women who are currently employed in the AOI represent 3.9% of total women. Significant regional variation in female economic activity is apparent. In broad terms, areas with high economic activity for both genders have a higher rate of female participation- Khulna Sadar shows the highest rates for both women's employment and employment for both genders. While Jessore Sadar and Satkhira Sadar are the upazilas with employment rates for both genders of over 30% in the AOI, women employment rates were low, with only 5.2% and 4.5% of women employed in Jessore Sadar and Satkhira Sadar, respectively. On the other hand, in rural upazilas, 7.4% of women in Shibchar (Madaripur zila) were employed while the employment rate for both genders was 29.3% (Figure 36).



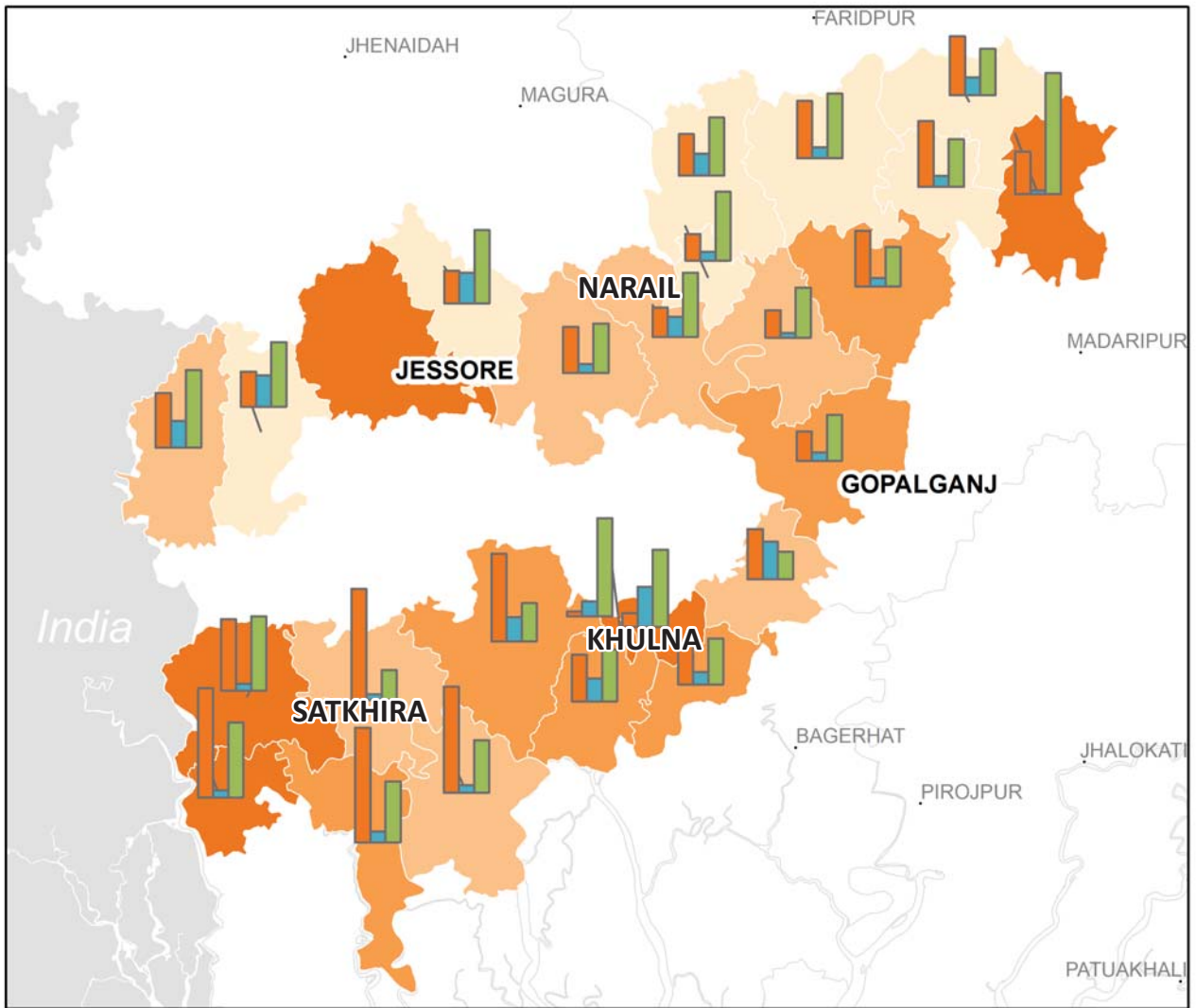
Figure 36. % of overall employment vs. female employment, 2011

The proportion of labor force participation is a critical factor in the composition of the economic sectors providing jobs to women. The breakdown in Figure 38 reveals a higher proportion in the service sector, while more men are employed in the agriculture and industry sectors.

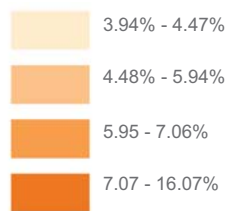


(Top) Figure 37. % of female economic activity status, BBS 2011

(Bottom) Figure 38. % of female employment by sectors



% of female employment



■ Agriculture 
 ■ Industry 
 ■ Service

Data Source:  
BBS (2011)

Map and analysis created by GeoAdaptive (2017)

Figure 39. % of female employment by upazila and economic activity level by three sectors. At the zila level, female employment is high in Bagerhat, Gopalganj, Khulna and Satkhira. More women are economically active in the service sector in most of the upazilas. In Assasuni, Tala in Satkhira and Paikgachaa in Khulna, female agriculture employment is dominant

## 2.5.2 Female Education Attainment

Education is essential for women to participate in economic activities, especially in Bangladesh where women make up more than half of the population. According to the 2011 Census, women have fewer opportunities for education and employment than men in Bangladesh. By ensuring women's participation in skills development programs, it is possible to optimize human capital and improve women's economic empowerment.

In the AOI, 31.3% of women are without any type of education. However, as shown in Figure 40, about 32.4% of women attained primary education with a high concentration of women observed through Khulna zila including Rupsha, Mollahat, and Muksudpur to zilas in Dhaka division (Figure 42). The secondary education attainment of females dropped to 26.5% for the junior level, and only 8.5% of women passed the Secondary School Certificate (SSC) and Higher Secondary School Certificate (HSC). This result shows the need to promote secondary education attainment for women. Upazilas such as Khulna Sadar and Jessore Sadar are observed to have higher secondary and tertiary educated women.

Figure 41 supports the relationship between education and workforce participation by showing the positive correlation between female education and economic activities in the AOI. Areas with higher education levels (secondary and tertiary) tend to have higher female economic activity. Some disparities were identified in upazilas including Sarsha, Jhikargacha near the Indian border and Boalmari, Nagarkanda, Sadarpur, and Bhanga along the route to Dhaka.

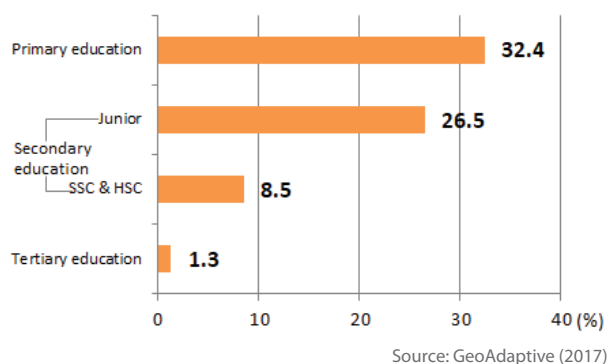


Figure 40. Comparison between female education attainment by education level

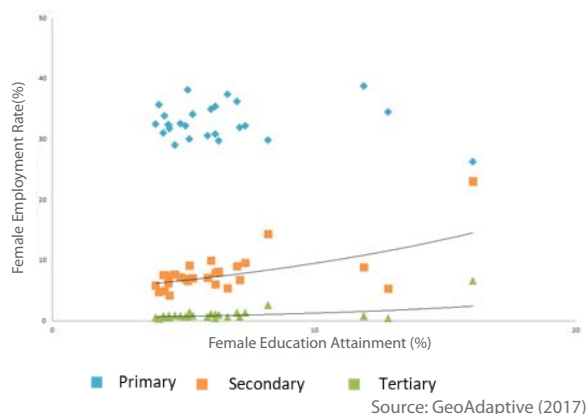
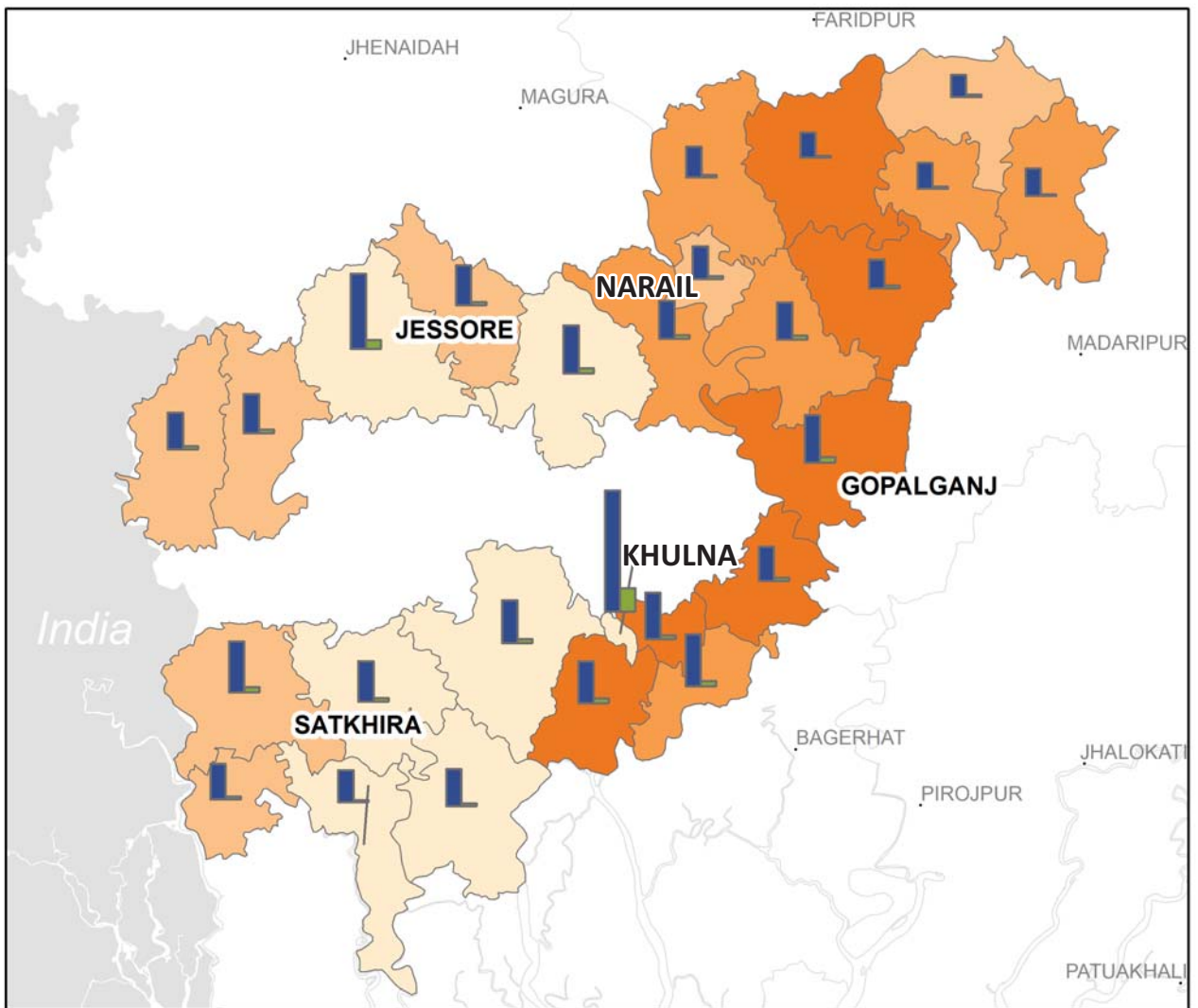
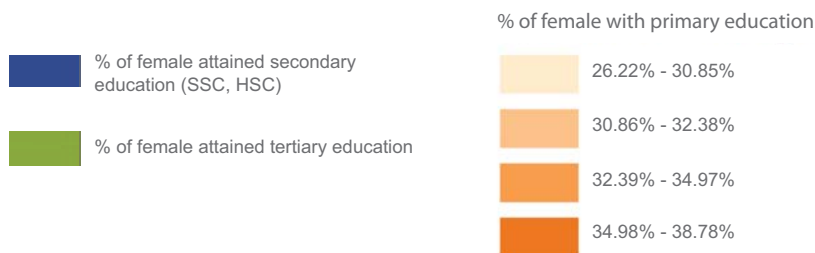


Figure 41. Correlation between female education level and female employment rate



Data Source:  
BBS (2011)



Map and analysis created by GeoAdaptive (2017)

Figure 42. % of females with primary education. Bar graph indicates education attainment by secondary and tertiary educations for females. Upazilas with higher primary education attainment for females are concentrated from the central to northeastern part of the AOI. Khulna Sadar shows the highest female education attainment for all levels (primary, secondary and tertiary)

---

# Multisectoral Assessment

---



Image by GeoAdaptive



## OBJECTIVES

The objective of this multidimensional assessment was to examine the relative performance of a series of socioeconomic indicators by benchmarking statistical thresholds from global organizations. By analyzing these indicators geographically, disaggregated areas of opportunities can be identified for establishing women-driven SMEs in the AOI. In addition, the results can improve the regional understanding of constraints and territorial barriers.

The objectives of this process are to evaluate:

- The distribution of opportunities and constraints associated with: 1) population demographics, 2) infrastructure, 3) conditions for social services, 4) population economic conditions, and 5) women's socioeconomic status as it relates to women-driven SMEs development; and
- The co-existence of critical conditions representing territorial opportunities

## SPATIAL INDICATORS

The identification of areas with individual and multisectoral opportunities was completed by comparing spatial performance indicators against geostatistical thresholds (Table 9). Each indicator was quantified and geographically represented as an evidence-based measurement derived from local data. Results were shown as geographical clusters, highlighting the existing constraints linked to each indicator.

Collectively, the representation of these opportunities and constraints provide a sector-specific decision support tool, while also offering insights on multisectoral strategies, which could be used to improve regional social services and the participation of women in the formal economy.

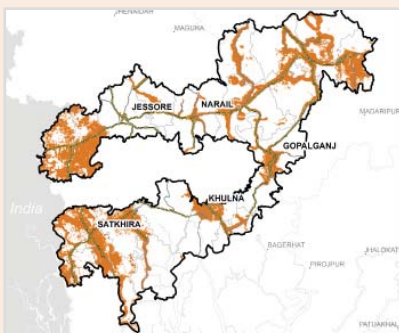
Category	Indicator	Opportunity Measurement
Demographics	Population density	Areas with top two quantiles (out of 5) from high population density (population per pixel)
	Urban population	Areas with top two quantiles (out of 5) from high % of urban population
	Female: male ratio	Areas with top two quantiles (out of 5) from high female:male ratio
	Labor force (working age)	Areas with top two quantiles (out of 5) from high % of working age (15-59) concentration
Infrastructure	Road access	Areas with top two quantiles (out of 5) from high road density per population
	Public transit access	Areas within 1hr access to public transit hubs (rail and bus stations)
	Electricity access	Areas with top two quantiles (out of 5) from high % of household with electricity
Social conditions	Hospital access	Areas within 30 minute access to the nearest 3 hospitals
	Literacy rate	Areas with top two quantiles (out of 5) from high % of literate population
	Education attainment	Areas with top two quantiles (out of 5) from % of population with education attained
Economic conditions	Extreme poverty	Areas with top two quantiles (out of 5) from low % of households with extreme poverty
	Income	Areas with top two quantiles (out of 5) from high household income (USD) distribution
	Economic activity (Employment)	Areas with top two quantiles (out of 5) from % of population employed
	Agriculture employment	Areas with top two quantiles (out of 5) from % of population employed in agriculture sector
	Industry employment	Areas with top two quantiles (out of 5) from % of population employed in industry sector
	Service employment	Areas with top two quantiles (out of 5) from % of population employed in service sector
	SME establishments	Areas with top two quantiles (out of 5) from % of high SME establishment
Women's socioeconomic status	Female employment	Areas with top two quantiles (out of 5) from % of female population employed
	Female education	Areas with top two quantiles (out of 5) from % of female population with some level of education attained

Source: GeoAdaptive (2017)

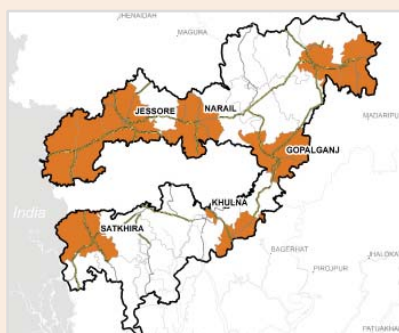
Table 9. Description of spatial indicators used in multisectoral assessment

# Identification- Constraints and Opportunities

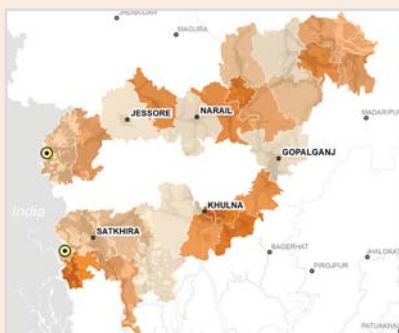
## Demographics



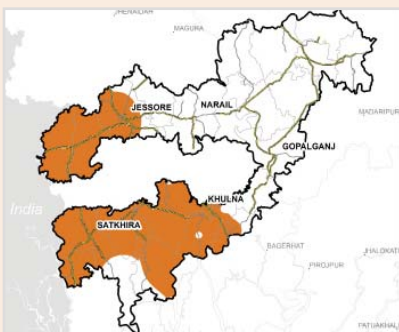
Areas with High Population Density



Areas with High Urban Population



Areas with High Female Concentration



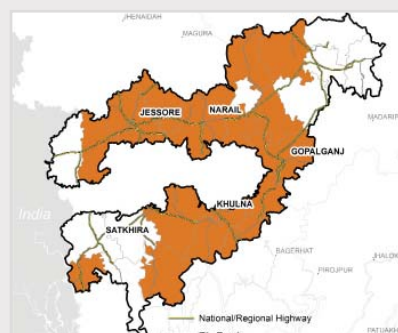
Areas with High Working Age Population

The relative level of each indicator is examined by applying statistical thresholds (Table 9) and proprietary analytical methods developed by GeoAdaptive to achieve a sub-upazila resolution. The results (Figure 43) allow verification of:

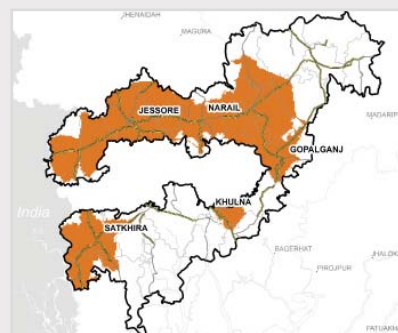
- Territorial patterns of the constraints and opportunities by demographics, infrastructure, social and economic conditions, and women's socioeconomic status
- Coexistence of critical levels of various constraints and opportunities

This geographic representation is intended to provide a multisectoral decision support tool, while also enabling sector-specific assessment of possible strategies, in order to promote diversification of the regional economy.

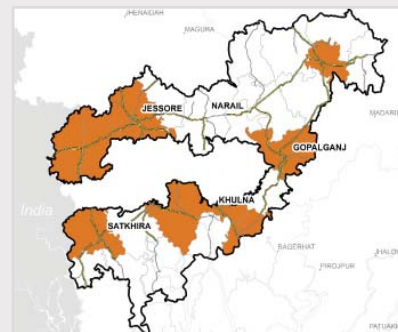
## Infrastructure



Areas with High Road Access

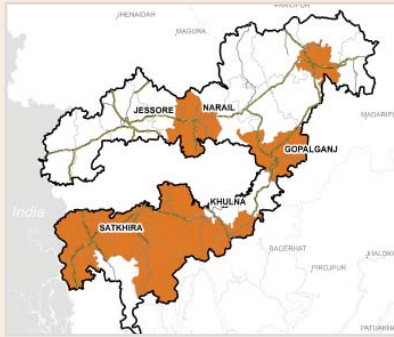


Areas with High Public Transit Access

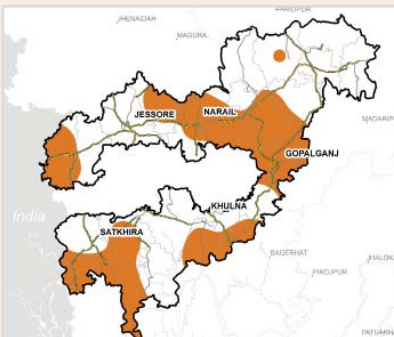


Areas with High Electricity Access

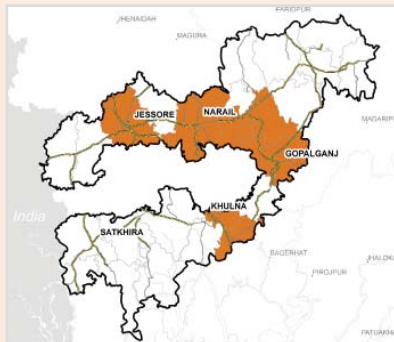
## Social Conditions



Areas with High Health Access

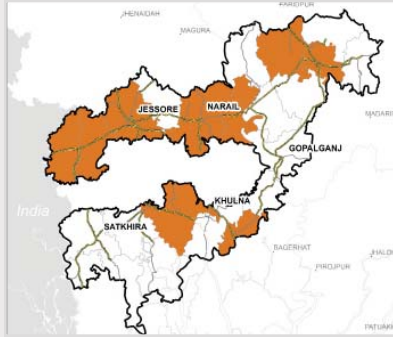


Areas with High Education Attainment (male+female)

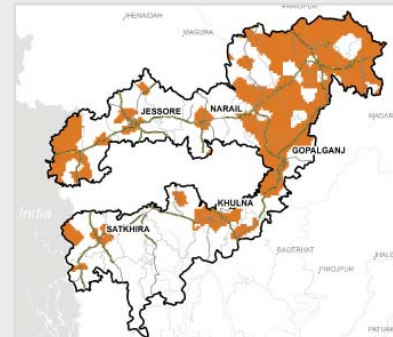


Areas with High Literacy (male+female)

## Economic Conditions



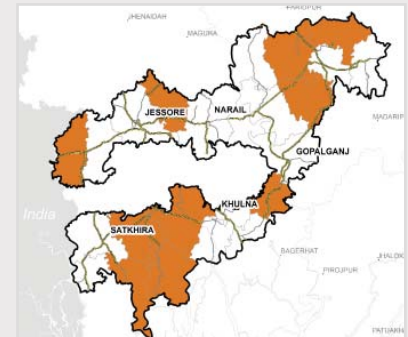
Areas with Low Extreme Poverty



Areas with High Income



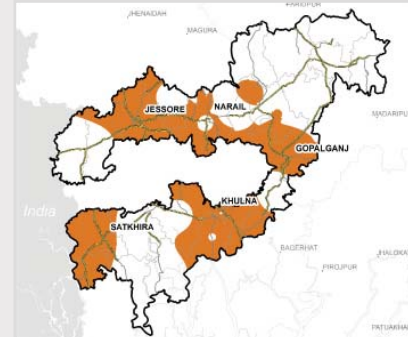
Areas with High Employment



Areas with High Agriculture Activity



Areas with High Industrial Activity

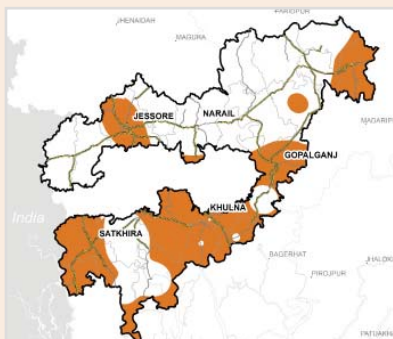


Areas with High Service Activity

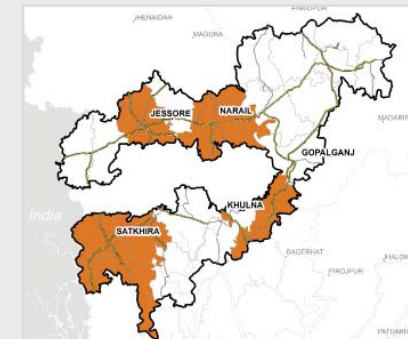
## Women's Socioeconomic Status



Areas with High Female Education



Areas with High Female Employment



Areas with High SME Establishment

Figure 43. Spatial identification of opportunities for 19 indicators. Areas with opportunity for women-driven SMEs are colored orange based on the statistical thresholds provided in Table 9. Areas that are not colored are considered to have constraints, Source: GeoAdaptive (2017)

# Multisectoral Assessment

The results of this multisectoral analysis suggest that the AOI presents at least three areas with sociodemographic conditions representing areas of opportunity for women-driven SMEs. In the highest range of the index, 1.00% of the region has more than 15 coincident sociodemographic conditions, indicating potential for growth. Figures 44 and 45 and Table 10 show the coexistence of these factors in terms of the accumulated percentage of sociodemographic conditions for women-driven SMEs' development opportunities.

From a strategic point of view, this analysis is designed as a fundamental tool for decision making, from a multisectoral perspective, to identify areas with a minimum number of important socioeconomic factors, and to identify what type of constraints exist at the same time.

In addition, the results can be summarized by upazila to identify constraints and opportunities relevant to regional policy and investment decisions, as well as indicating the distribution of opportunity areas within upazilas for further analysis.

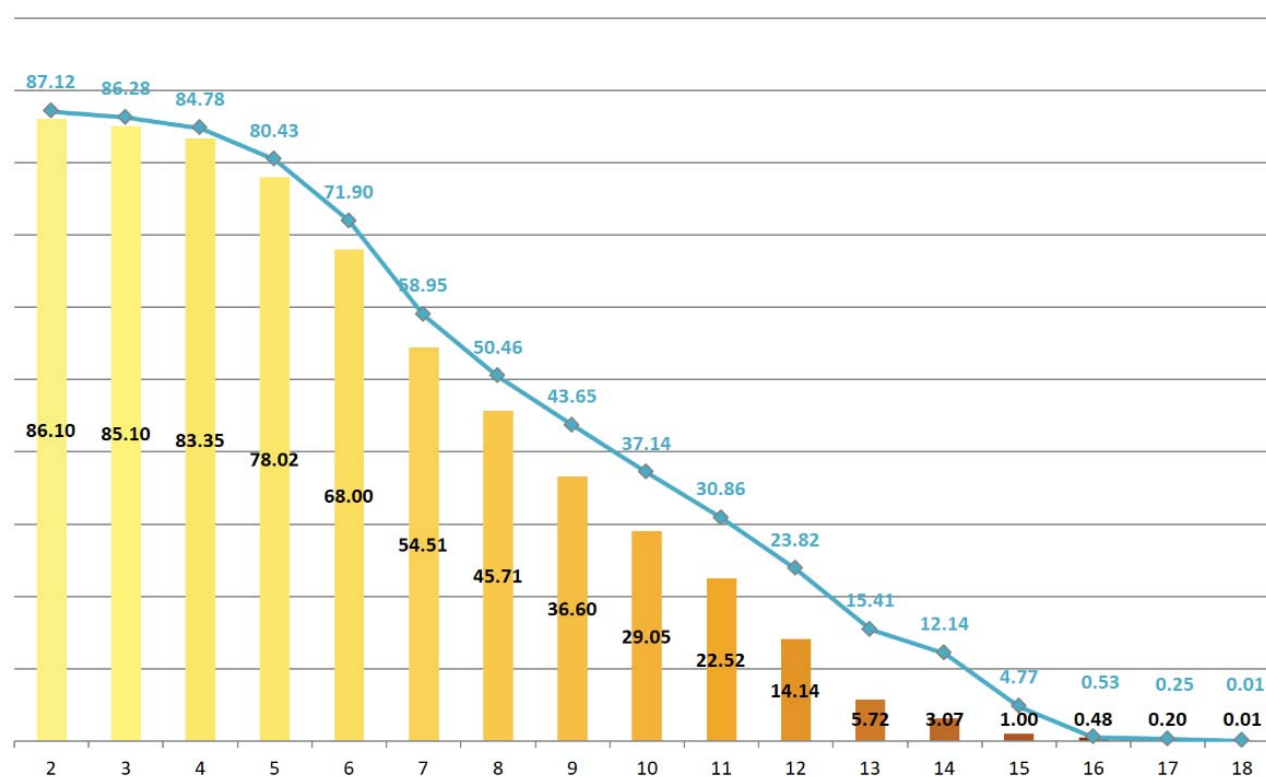
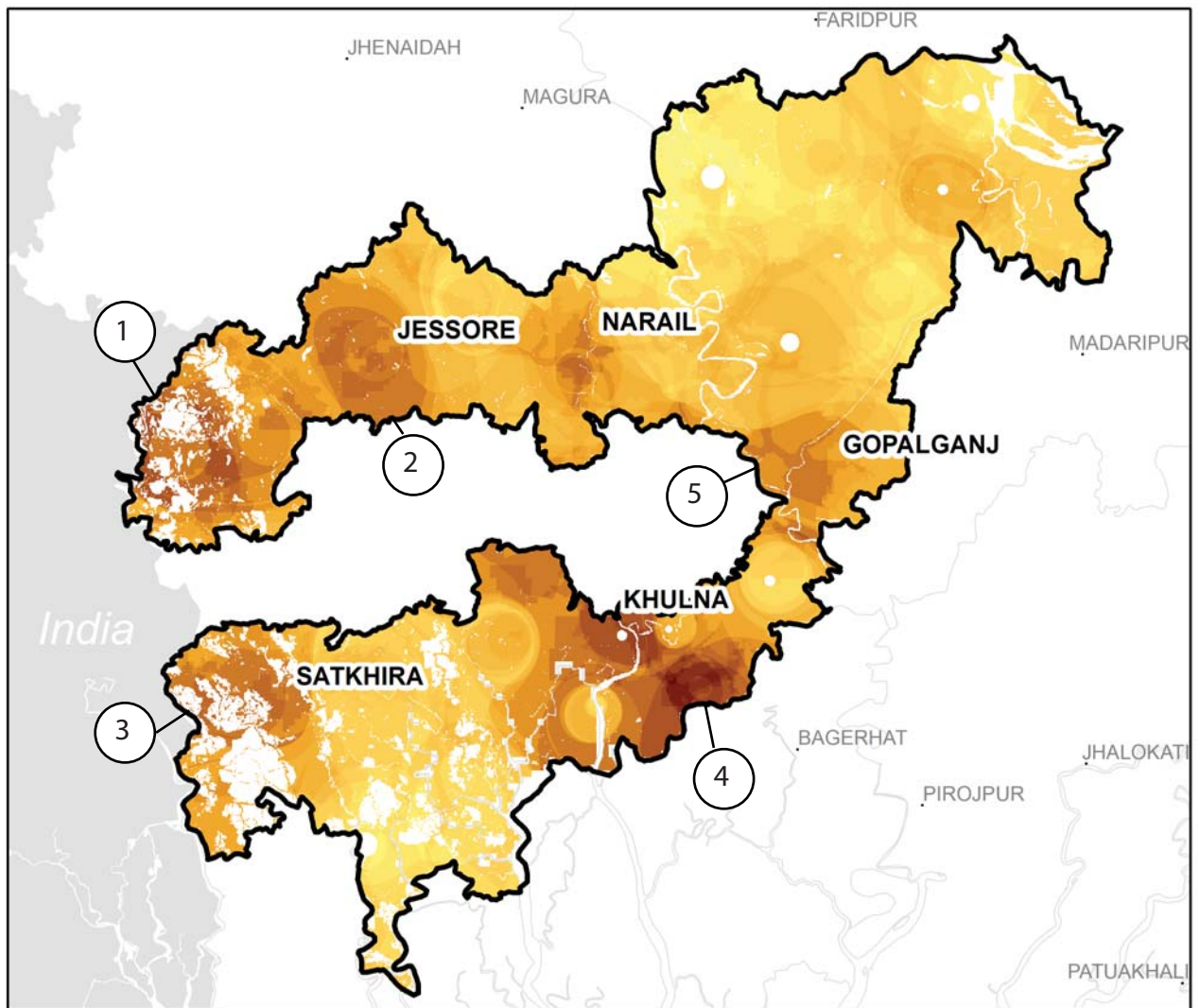


Figure 44. Percentage of total area and population residing by number of multisectoral opportunities

# of Opportunity	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
% of Area	86.1	85.1	83.4	78.0	68.0	54.5	45.7	36.6	29.1	22.5	14.1	5.7	3.1	1.0	0.5	0.2	0.01
% of Population	87.1	86.3	84.8	80.4	71.9	59.0	50.5	43.6	37.1	30.9	23.8	15.4	12.1	4.8	0.5	0.3	0.01

Source: GeoAdaptive (2017)

Table 10. Percentage of total area and population residing by number of multisectoral opportunities



Zone	1 Sarsha upzaila zone	2 Jessore Sadar zone	3 Satkhira Sadar zone	4 Khulna & Bagerhat zone	5 Gopalganj zone
Area	373.9 Km <sup>2</sup>	260.6 Km <sup>2</sup>	75.2 Km <sup>2</sup>	372.2 Km <sup>2</sup>	236.8 Km <sup>2</sup>
Population	430,626 (6.31 %)	41,854 (0.61 %)	115,325 (1.70 %)	832,982 (12.21 %)	221,952 (3.25 %)

Source: GeoAdaptive (2017)

Figure 45. Distribution of multisectoral opportunities in AOI. As derived from the analysis conducted, Bagerhat and Khulna zilas, as represented in distribution map below, areas with the highest socioeconomic and labor force opportunities are concentrated in:

- Border between eastern Khulna and western Bagerhat zila
- Satkhira zila, especially in Satkhira Sadar along the border with India
- Jessore zila, especially in Jessore Sadar and Sharsa upazilas along the border with India
- Western Gopalganj upzila including Gopalganj Sadar

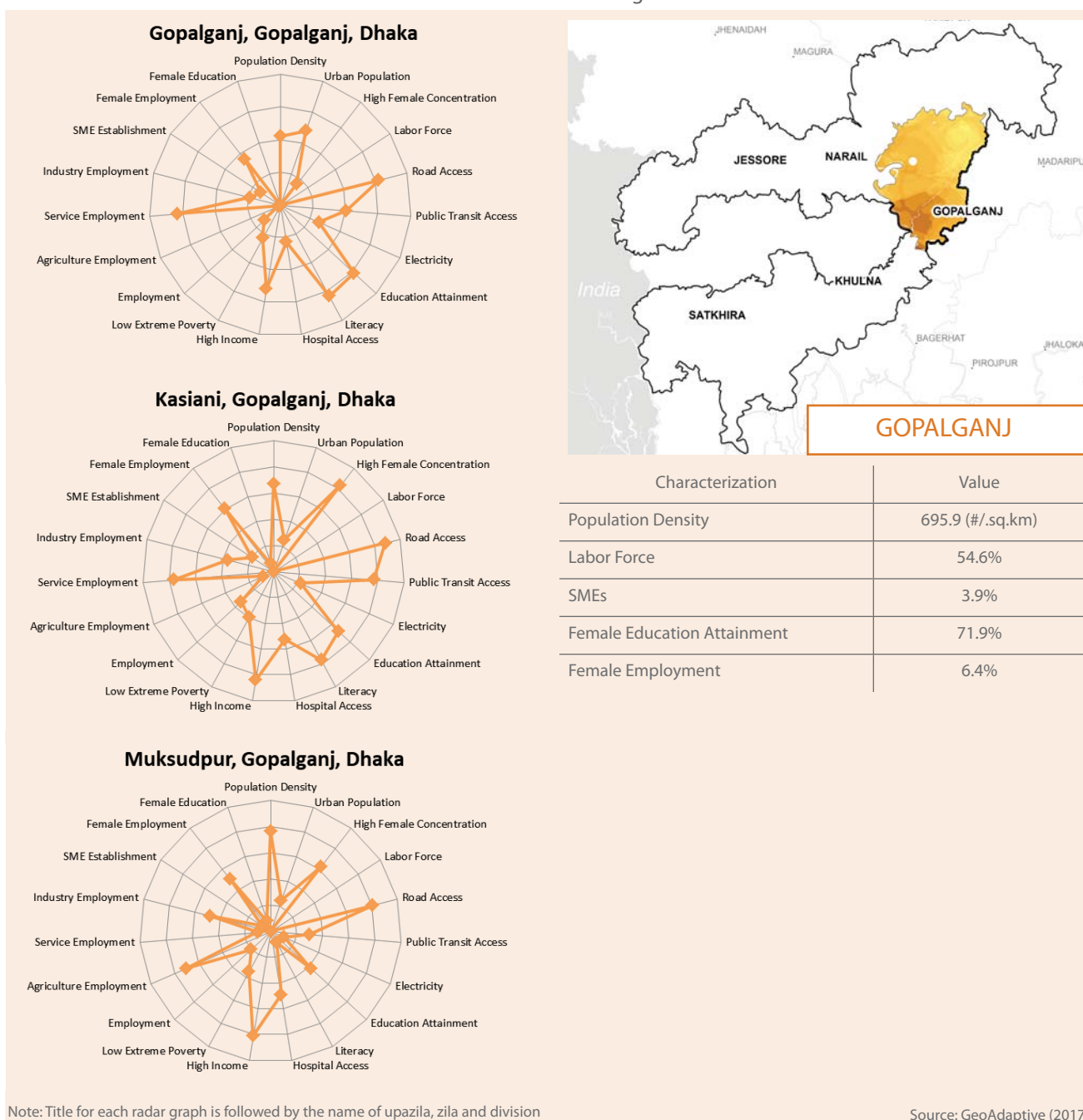
# Sociodemographic Trends by Zila & Upazila

Once the multisectoral diagnosis for the entire AOI was completed, it was also critical to identify and characterize within administrative districts (e.g. zila and upazila) to provide an understanding of the unique constraints and opportunities by sector.

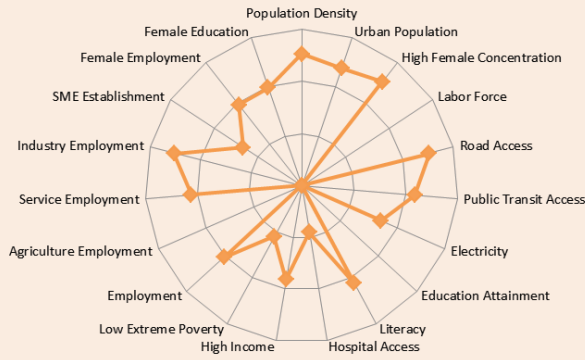
This characterization enables definition of the level of multisectoral complexity and relative magnitude of each problem in the upazila with respect to other gaps in the same area, as shown on pages 60-66.

This analysis allows for the detection of patterns, trends, and corresponding institutions that should participate in the definition of strategies.

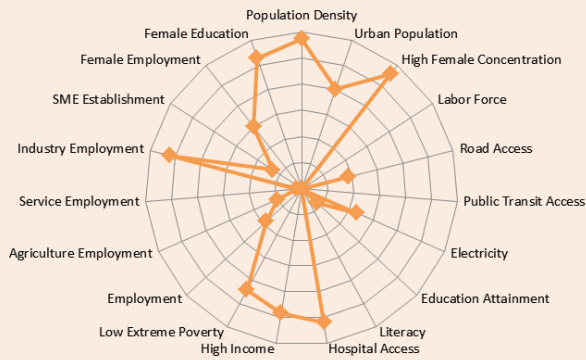
In addition to the identification and intensity of the constraints and opportunities present by upazila, the results of the geographical analysis provided in the geographic representation allowed the project team to extract sociodemographic and productive data that support the definition of the multisectoral assessment and the participation required for the potential strategies.



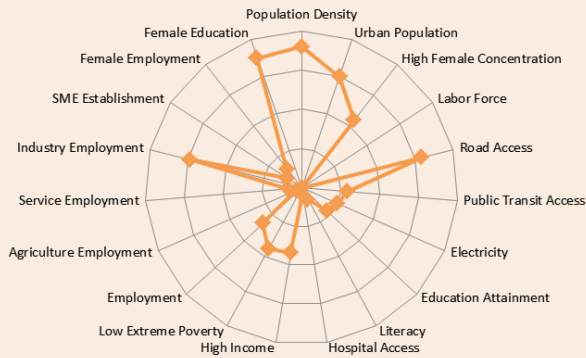
### Alfadanga, Faridpur, Dhaka



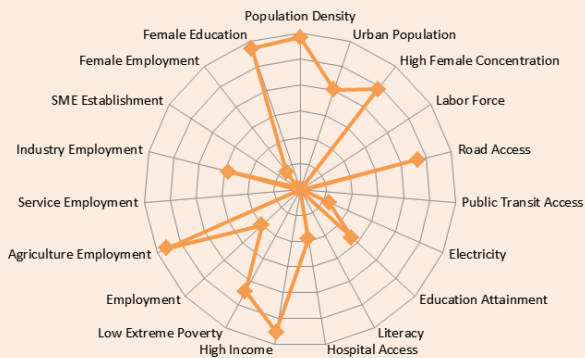
### Bhanga, Faridpur, Dhaka



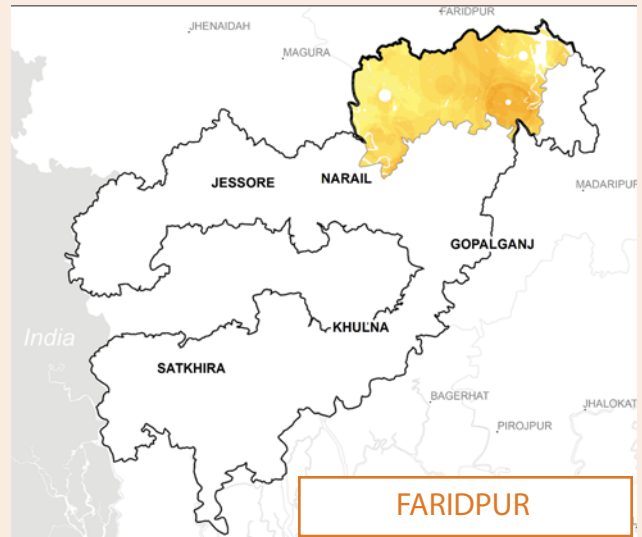
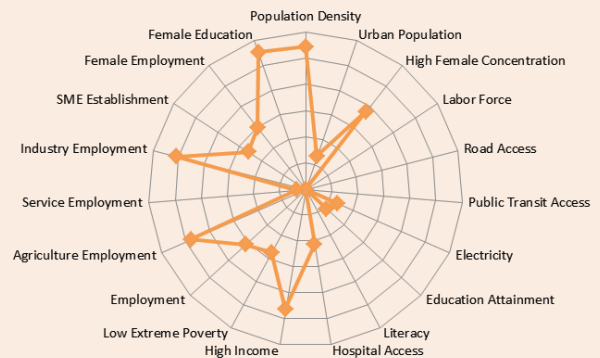
### Boalmari, Faridpur, Dhaka



### Nagarkanda, Faridpur, Dhaka



### Sadarpur, Faridpur, Dhaka

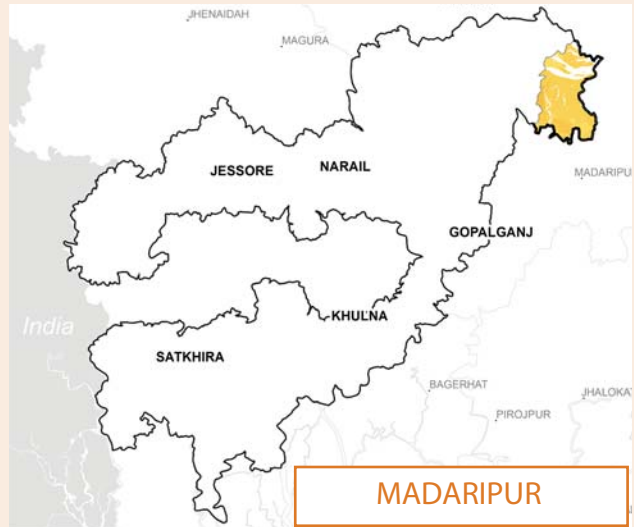
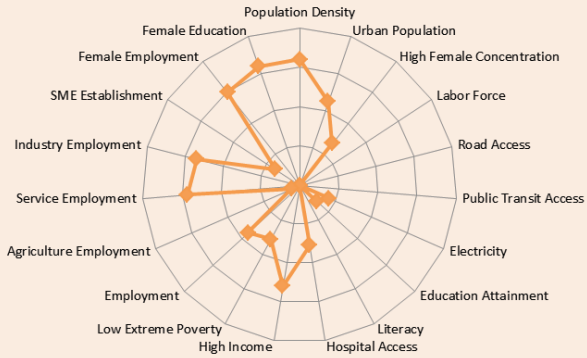


Characterization	Value
Population Density	628.7 (#/.sq.km)
Labor Force	54.5%
SMEs	3.3%
Female Education Attainment	62.4%
Female Employment	4.2%

Note: Title for each radar graph is followed by the name of upazila, zila and division

Source: GeoAdaptive (2017)

### Shibchar, Madaripur, Dhaka

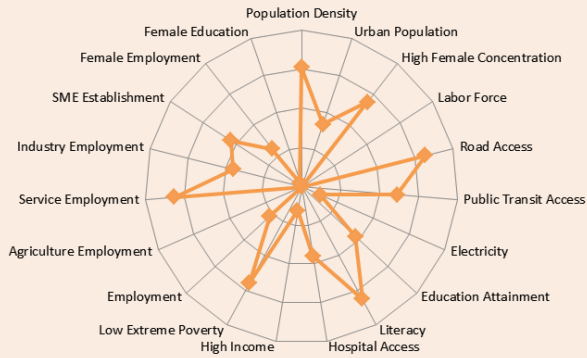


Characterization	Value
Population Density	904.1 (#/.sq.km)
Labor Force	53.4%
SMEs	4.5%
Female Education Attainment	60.1%
Female Employment	12.8%

Note: Title for each radar graph is followed by the name of upazila, zila and division

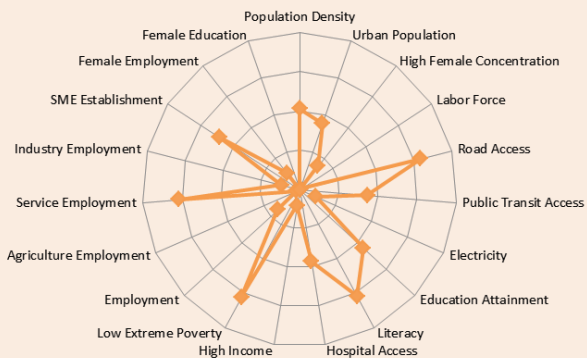
Source: GeoAdaptive (2017)

### Lohagara (Narail), Narail, Khulna



Characterization	Value
Population Density	619.2 (#/.sq.km)
Labor Force	56.9 %
SMEs	10.9%
Female Education Attainment	68.8%
Female Employment	5.0%

### Narail, Narail, Khulna

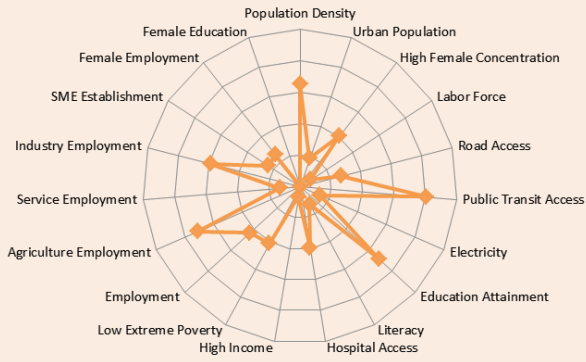


Note: Title for each radar graph is followed by the name of upazila, zila and division

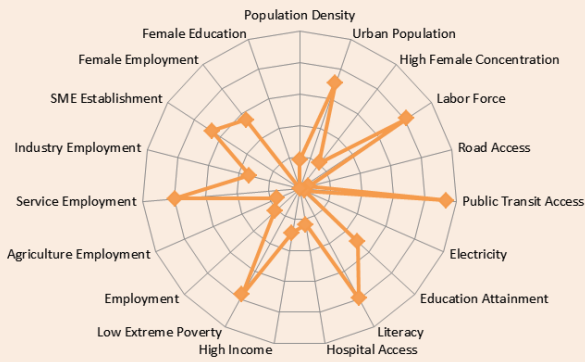
Source: GeoAdaptive (2017)



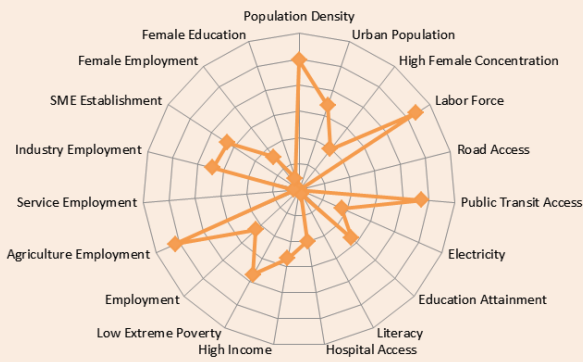
### Bagherpara, Jessore, Khulna



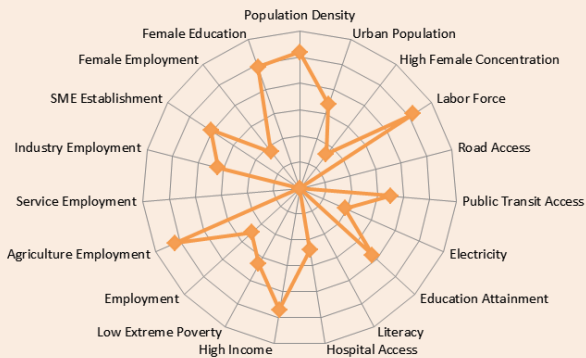
### Jessore, Jessore, Khulna



### Jhikargacha, Jessore, Khulna



### Sarsha, Jessore, Khulna

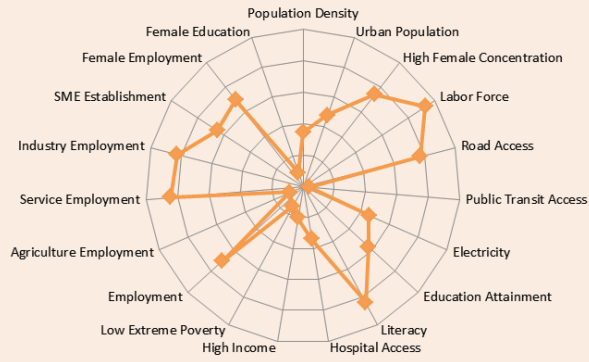


Characterization	Value
Population Density	1,011.8 (#/.sq.km)
Labor Force	61.9 %
SMEs	6.7%
Female Education Attainment	69.6%
Female Employment	5.5%

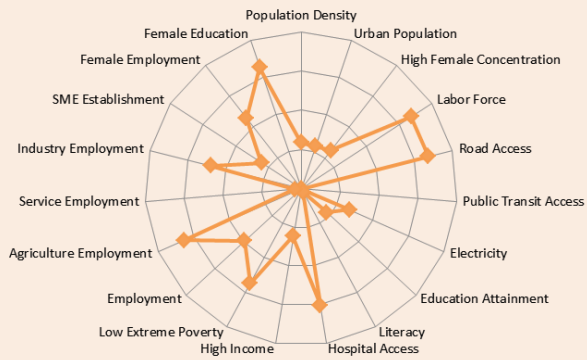
Note: Title for each radar graph is followed by the name of upazila, zila and division

Source: GeoAdaptive (2017)

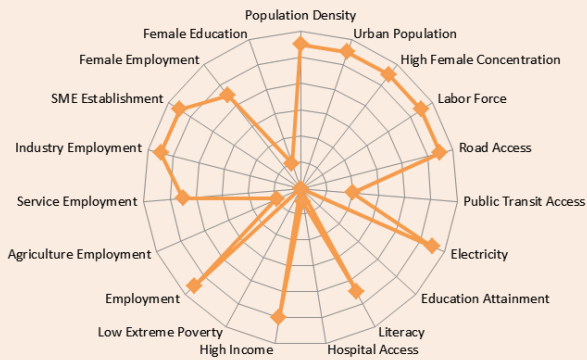
### Batiaghata, Khulna, Khulna



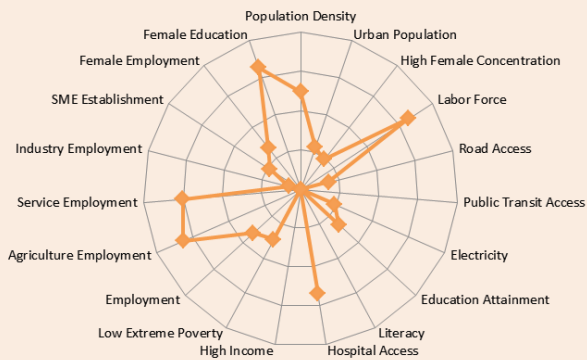
### Dumuria, Khulna, Khulna



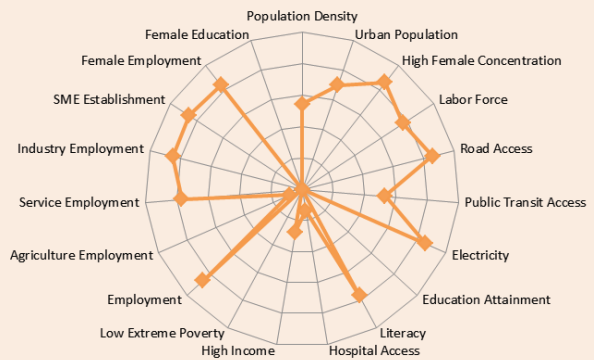
### Khulna Metro, Khulna, Khulna



### Paikgachha, Khulna, Khulna



### Rupsha, Khulna, Khulna

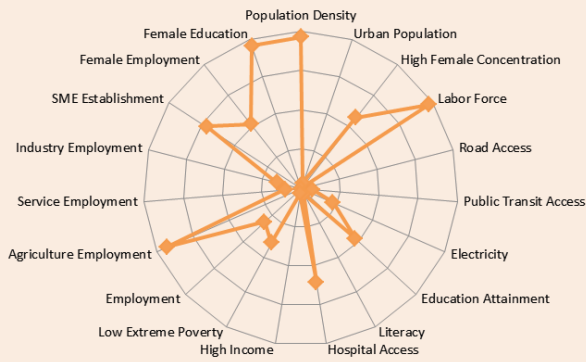


Characterization	Value
Population Density	804.8 (#/.sq.km)
Labor Force	62.1 %
SMEs	10.3%
Female Education Attainment	72.1%
Female Employment	9.3%

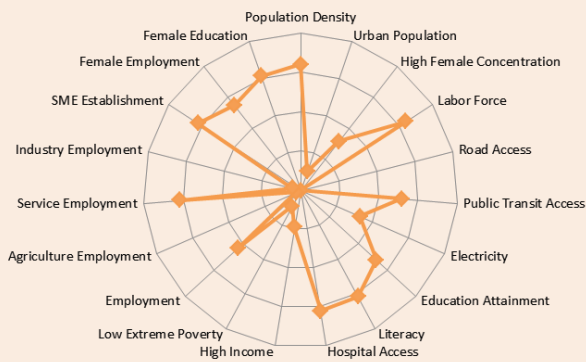
Note: Title for each radar graph is followed by the name of upazila, zila and division

Source: GeoAdaptive (2017)

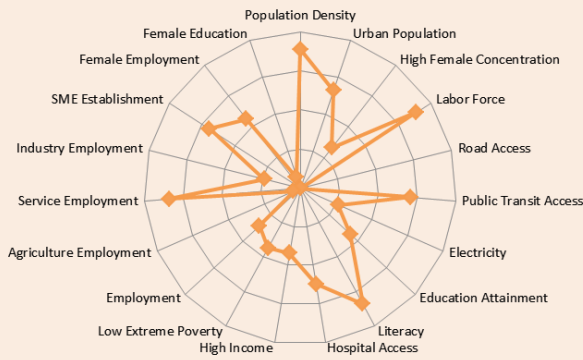
### Assasuni, Satkhira, Khulna



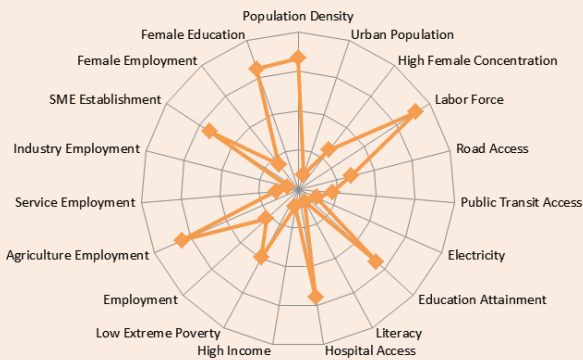
### Debhata, Satkhira, Khulna



### Satkhira, Satkhira, Khulna



### Tala, Satkhira, Khulna

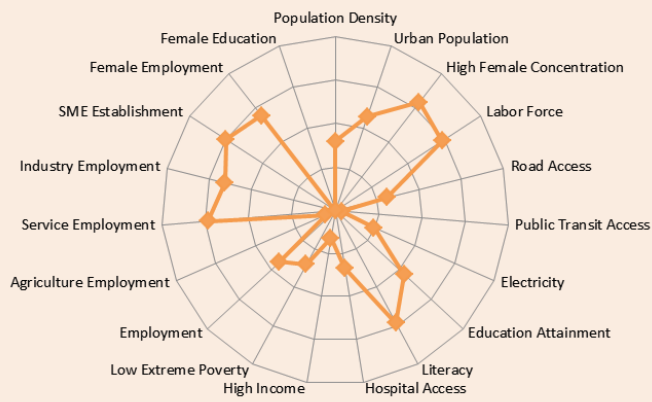


Characterization	Value
Population Density	848.9 (#/.sq.km)
Labor Force	61.5 %
SMEs	11.8%
Female Education Attainment	66.6%
Female Employment	6.3%

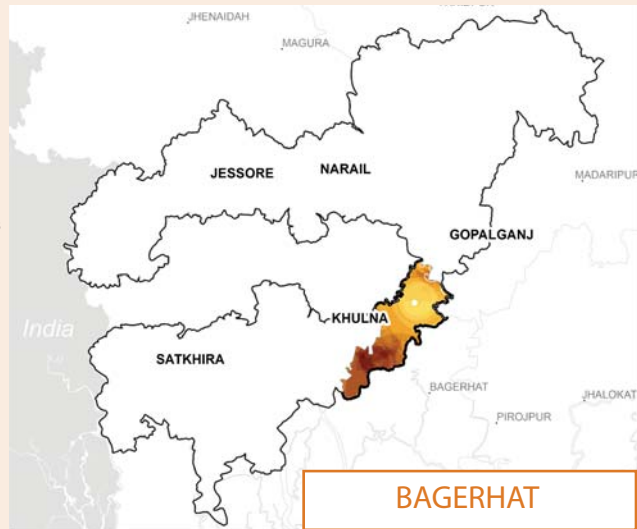
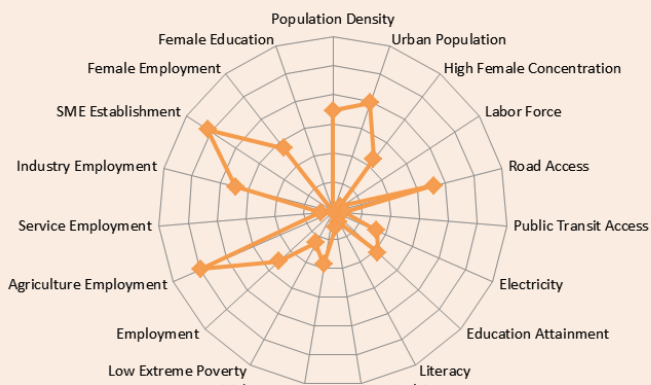
Note: Title for each radar graph is followed by the name of upazila, zila and division

Source: GeoAdaptive (2017)

### Fakirhat, Bagerhat, Khulna



### Mollahat, Bagerhat, Khulna



Characterization	Value
Population Density	607.5 (#/.sq.km)
Labor Force	57.6 %
SMEs	10.9%
Female Education Attainment	74.0%
Female Employment	5.6%

Note: Title for each radar graph is followed by the name of upazila, zila and division

Source: GeoAdaptive (2017)

# Insight

---

Linking economic products and  
socioeconomic assessment



---

## OVERVIEW

Separately, chapters 1 and 2 present the methodological underpinnings and results of the product selection and socioeconomic and infrastructure analyses. Together, they can be thought of as diagnostic tools whose aim is to derive vital statistics on the people, infrastructure and the entrepreneurial activity of women in the SME sector in Bangladesh.

As a whole, chapters 1 and 2 begin to inform a deep and intuitive understanding of the AOI and provide the necessary research base that allows for this first set of insights into the structural and economic barriers that women face in integrating themselves into existing value chains as well as identifying opportunities that could improve the business environment for value chains representative of women-driven SMEs.

The preliminary insights derived from chapter 1 and chapter 2 can be applicable to understand:

- Considerations that affect the basic living conditions of the workforce
- Considerations that improve the business environment of products that are representative of women-driven SMEs

The first of these considerations identifies insights that revolve around the identification of gaps and opportunities as they relate to improvements in social service delivery and public infrastructure access, in order to increase productivity through greater development of human capital and greater population mobility. The second consideration identifies insights that improve the business environment for products that are representative of women entrepreneurs, which includes general insights of possible backward and forward linkages that could lead to greater participation of women and women entrepreneurs in multiple links of the dairy, floriculture and fishery value chains.

## 1 Preliminary Insights on Social Service Delivery

### Education

Increase education options in the AOI as investment in education service delivery increases the development of human capital:

- Expand education facilities in Dhaka division of AOI to increase educational opportunities for the population
- Improve educational programs in areas such as Jessore Sadar, Rupsha and Dumuria where large portions of the population are uneducated, even though many education facilities exist
- Advance female attainment of primary education in zilas such as Bagerhat, Narail, Jessore, and Khulna

### Health

Increase health options that support human capital and community health:

- Emphasize the need of comprehensive health service facilities in Boalmari and Bagerhat upazilas where there is no single hospital, while family welfare centers are available in other upazilas in the AOI
- Improve access time to hospitals in Khulna Sadar, the most densely populated urban area in the AOI

## 2 Preliminary Insights on Public Infrastructure Accessibility

Promote transportation mobility by upgrading the road network:

- Provide a paved road network in Jessore and Satkhira to improve mobility among dairy, fisheries, and floriculture production sites

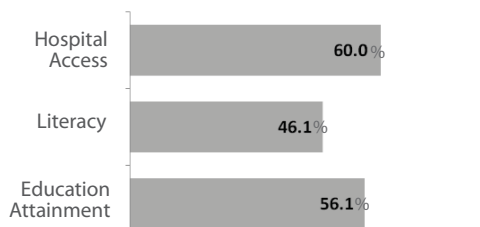
Increase public transportation facilities to improve accessibility:

- Provide transit hubs especially for railways at the peripheries of Khulna Sadar (e.g., Bariaghata, Dumuria) to increase connectivity between production sites and metropolitan centers
- Extend railways and transportation services to Dhaka

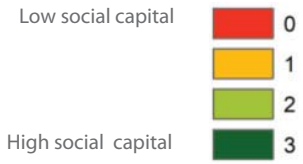
Expand electricity service in Satkhira zila

- Rural upazilas in Satkhira, the zila that borders India (e.g. Assasuni, Debhata, and Tala) are experiencing the highest inequality in terms of accessibility to electricity. Less than 30% of zilas report having access to electricity

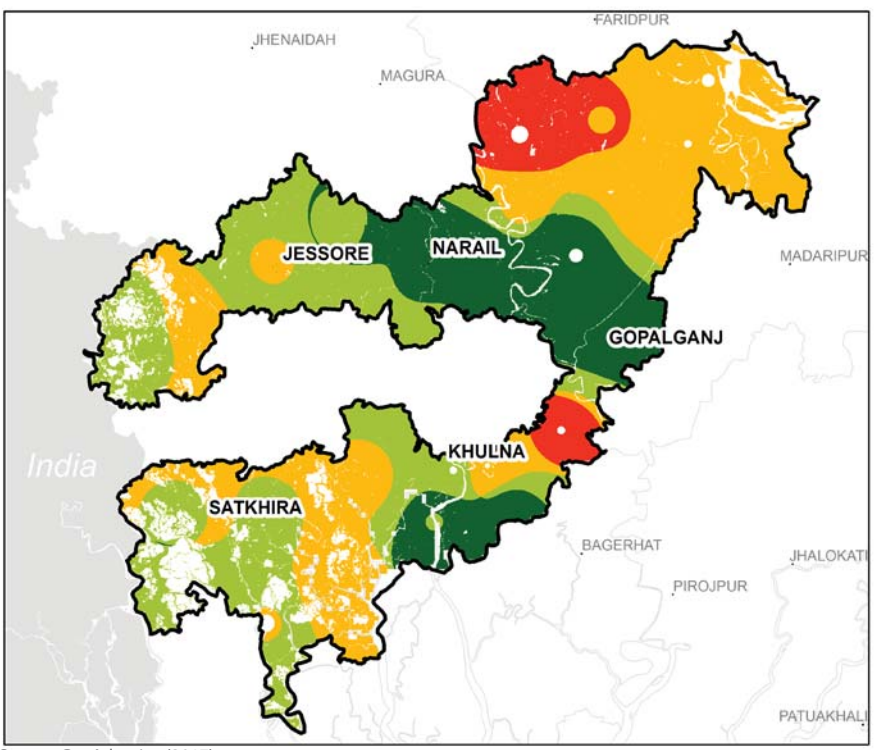




Note: Percentages add up to more than 100% as opportunities overlap over the same geographic area



	Area	Population	Female Labor Force (age 15-59)
1	31.5% (2,763.1 km <sup>2</sup> )	32.7% (2,227,929)	19.7% (674,988)
2	27.6% (2,419.7 km <sup>2</sup> )	36.2% (2,468,727)	19.6% (671,537)
3	19.2% (1,681.1 km <sup>2</sup> )	15.9% (1,085,093)	10.2% (349,377)



Source: GeoAdaptive (2017)

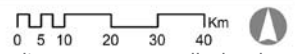
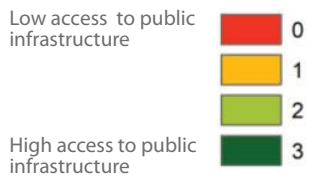
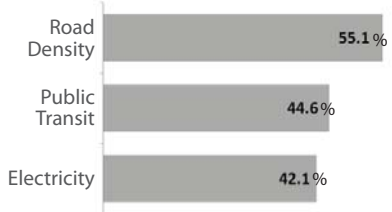
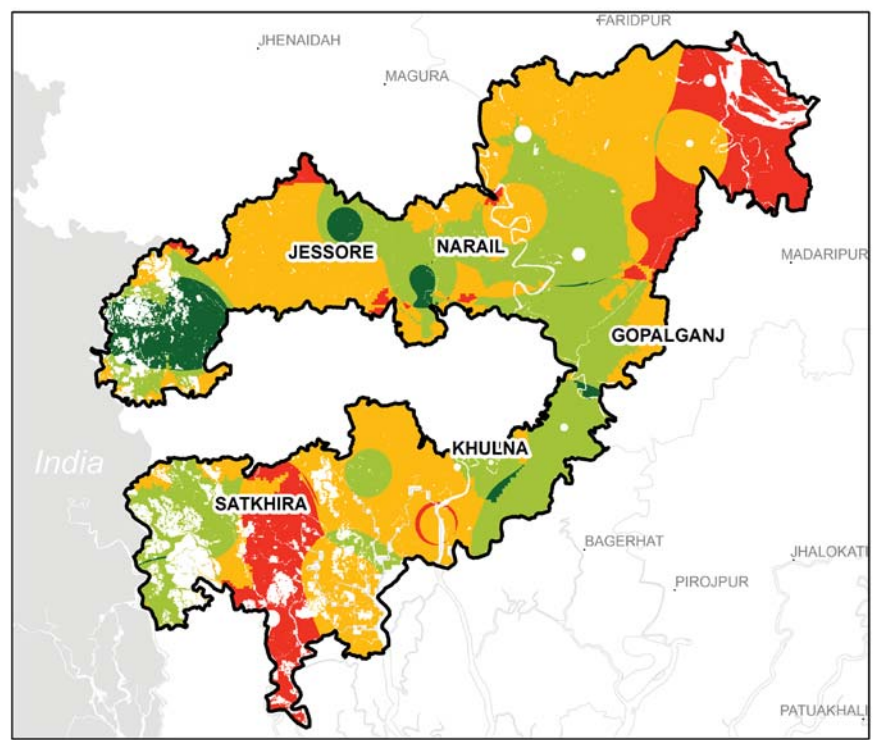


Figure 46. Social capital indicators and thresholds, areas in red indicate locations that have poor access to hospitals, have low literacy rates as well as a low levels of educational attainment



	Area	Population	Female Labor Force (age 15-59)
1	39.4% (3,448.9 km <sup>2</sup> )	35.9% (2,448,469)	20.5% (709,718)
2	28.3% (2,475.8 km <sup>2</sup> )	33.9% (2,309,278)	20.1% (690,777)
3	4.6% (400.9 km <sup>2</sup> )	6.7% (455,511)	4.0% (137,388)



Source: GeoAdaptive (2017)

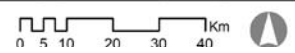


Figure 47. Public infrastructure indicators and thresholds, areas in red indicate poor access to the regions road and electricity network which affects the regions flow of goods and people

The study's AOI presents a challenge in the sense that it spans 8 different districts or zilas, each zila differs in its comparative advantage in the production of products and agricultural goods. In these zilas, there are over 20 products in which one of the 8 zilas produces competitively relative to the rest of the country. The question then becomes not only which products are representative of women-driven SME' but also which products can provide benefits to the majority of the zilas in the area of interest, given that some zilas have a comparative advantage in the production of some goods over others.

After evaluating the spatial of distribution of agricultural productivity for the 8 zilas, the products selected derive benefits or have the potential to derive benefits to all the zilas in the AOI.

Floriculture and fisheries demonstrate high comparative advantages relative to the rest of country and the other zilas in the AOI.

As Figures 48 and 49 show, cut flowers and fishery production are concentrated in Jessore and Bagerhat, therefore investments relative to these sectors in these zilas are likely to produce much larger returns. In an effort to avoid spatial inequalities, dairy value chain development will likely benefit and engage women and women entrepreneurs in multiple links of the value chain. Therefore, while cut flowers and fishery products provide benefits to 4 out of the 8 zilas, dairy is more equitably distributed in terms of production in the region, allowing a more equitable distribution of benefits given investment in these value chains.

To build a well-balanced and stable economic base in the AOI to alleviate poverty and provide employment opportunities, it would make sense to:

- Create and maintain a business environment in areas such as Gopalganj zila, which has a low employment rate and a high percentage of population in extreme poverty

To encourage specialization for SME establishments, it would make sense to:

- Expand agriculture-related SMEs in upazilas such as Assasuni, Tala in Satkhira zila, and Narail Sadar, which has the highest SME population/establishment involved and highest percentage of economic activities in agriculture
- Expand service-related SMEs in Khulna Sadar, which has the highest SME population/establishment involved and highest percentage of economic activities in services

To promote and integrate gender-responsive education offers and economic opportunities, it would make sense to:

- Advance women's primary education in zilas such as Bagerhat, Narail, Jessore, and Khulna

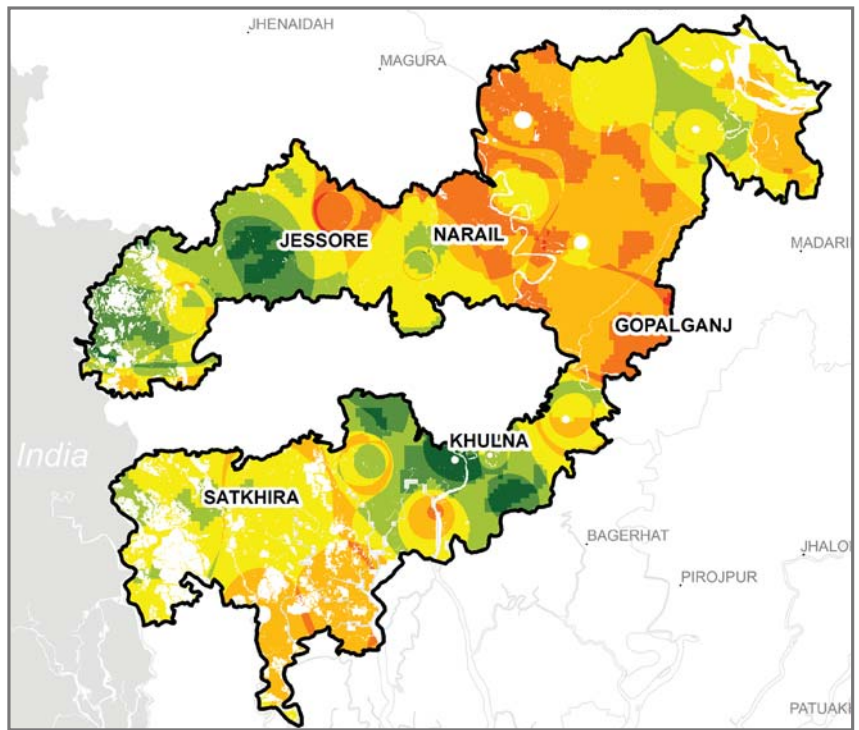
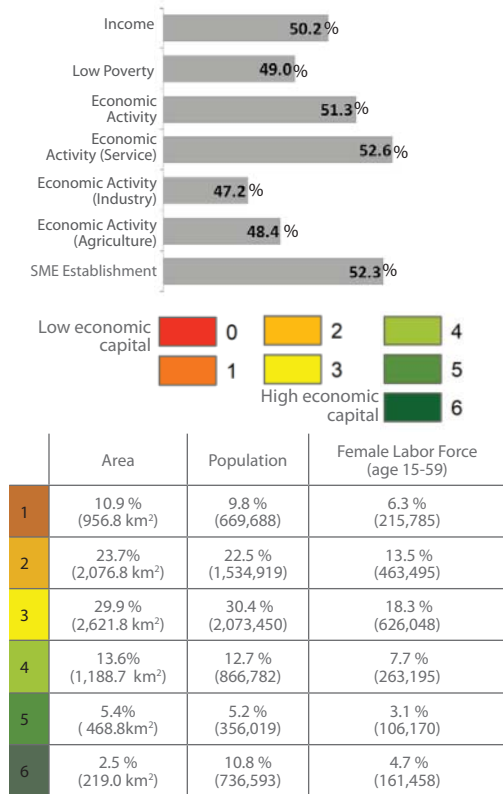


Figure 48. Economic Indicators and Thresholds, areas in red/orange represent areas with poor economic indicators which are indicative of the overall economic prosperity and economic health of the area.

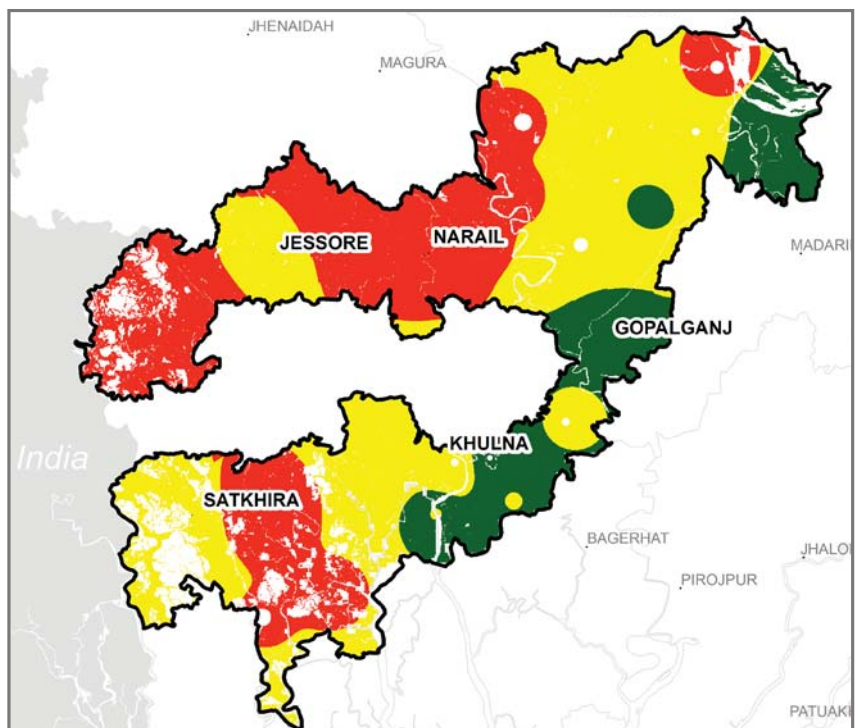
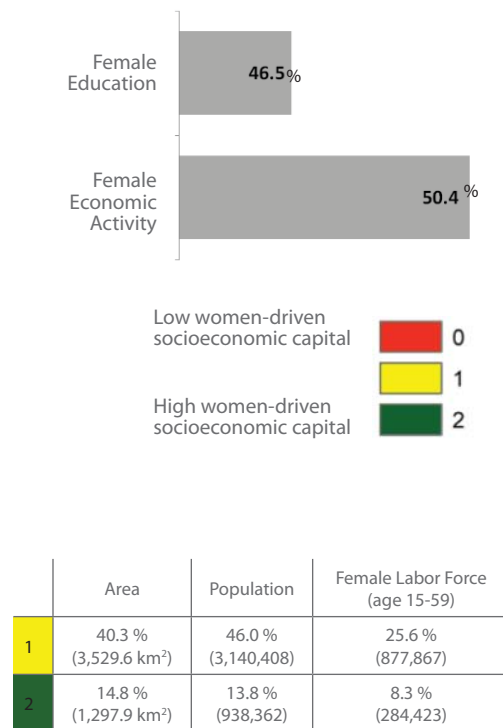


Figure 49. Socioeconomic Status of Women Indicators and Thresholds, areas in red indicate places where women have poor educational attainment and low rates of employment.

# SUMMARY

## Findings from Chapters 1 and 2

### 1 SME women entrepreneurs are highly represented in the dairy industry

- In the area of interest, 153 women entrepreneurs responded as leading in the agribusiness/leather/jute sectors
- Over 36% of women entrepreneurs in the SME Foundation's directory reported being in the dairy sector
- Satkhira zila had the largest number of dairy SMEs led by women

### 2 In the AOI, 95% of SME agglomeration are agribusiness related

- The SME Foundation reported over 4,000 cut flower SMEs in the area of interest, primarily in Jessore

### 3 High existing labor force and potential growth in 15 years

- 41.3% of population between ages of 25 and 59 can actively participate in the economy. About 59.0% of population is identified as populations with labor force potential (age between 15 and 59)
- 32.6% of the population is in the age range of 0-14
- The highest concentration of people of labor force participation age are in the metro regions including Khulna Sadar, Jessore Sadar and Satkhira Sadar

### 4 Low population density

- The AOI has shown a lower rate of population density growth (1.03%) through the last 10 years compared to the national level (1.07%)
- Population density is highest in Khulna Sadar and its neighboring Rupsha upazila; however, population density decreased in Khulna Sadar, which is indicative of urban sprawl

5

Potential opportunities exist for female development; however men dominate the labor force

- The AOI includes a higher proportion of women than at the national level
- Women are employed across all economic sectors: service, agriculture, and industry
- However, only 6.8% of women reported being economically active
- The male:female employment ratio for the region is 13.7:1, while at the national level it is 9.5:1
- Female economic activity is linked to secondary and tertiary education since a positive correlation was observed between education attainment and employment among women in the AOI

6

The condition of the road network and public transit network affects the flow of goods and people.

- 64% of roads are unpaved, including in major metropolitan areas
- About 52.1% of population is within one hour access to public transportation infrastructure (including bus and railway); however infrastructure is clustered in urban areas

7

The lack of basic services in the region affects the productivity of the labor force

- Extreme cases of unequal electricity access in households are observed. Upazilas with high agricultural employment rates (e.g. Assasuni in Satkhira zila) are experiencing low rates of household electrification

8

Limited social services in the region affect the basic living conditions of the work force

- Low female primary education completion rate (32.4%) and secondary education completion rate (8.5%)
- While 38.5% of population has reasonable access (less than 30 minute travel time) to the nearest hospital; rural areas have limited access to healthcare facilities that provide comprehensive treatment
- Upazilas with high economic activity have limited healthcare access (e.g. Mollahat upazila faces hospital access times upwards of 100 minutes.)



# Chapter 3

---

## Spatial Economic Structure Analysis

## BACKGROUND AND OBJECTIVES

Value chains have evolved along with global markets to become increasingly complex and spatially diverse systems of certain products. For many SMEs, understanding the value chain for each specific product is an important first step in addressing market opportunities.

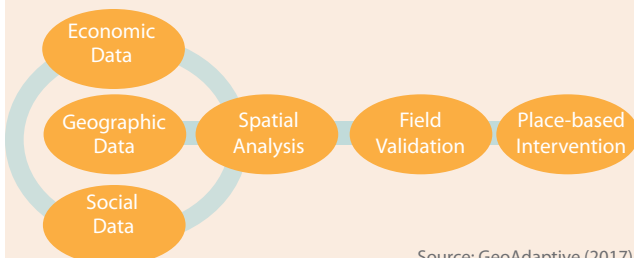
As a means to analyze these intricacies, the research team has developed diagrammatic and spatial approaches of value chains for three agricultural outputs - dairy, fisheries, and floriculture - to represent the performance of these products. Each value chain is assessed in three phases, production, transformation, and commercialization, to identify the actors and level of women's involvement, and ultimately to understand how the value chain is functioning spatially.

### Box 4. Spatial Value Chain

The analysis georeferences the location of each economic activity across firms and along the value chain. It links associated infrastructure (public and private) and the human capital conditions present in each value chain step (workforce catchment areas).

Using geostatistical algorithms, location proximity is evaluated and economic catchment areas are defined, which determine current and prospective economic outputs and the social and workforce inclusions.

Thus, this assessment allows for: 1) the proposal of robust place-based interventions to improve product, human capital and infrastructure outcomes, and 2) the development of an integrated appraisal that represents value chain dynamics across complex territories.



Source: GeoAdaptive (2017)  
More Information Available at Spatial Value Chain, GeoAdaptive

## 3.1 Diagrammatic Value Chain

The first step of the value chain assessment begins with an investigation and review of existing reports from the Bangladesh government, academic journals, and research from other accredited institutions such as the Food and Agriculture Organization (FAO).

The diagram captures the process from its:

1. Production on the farm
2. Transformation associated with processing the product
3. Commercialization when processed final products are ready for the domestic or export markets

These phases are then integrated into a traditional flow diagram.

## 3.2 Spatial Value Chain

Expanding on the results from the diagrammatic value chain, the spatial value chain aims to identify current spatial patterns of the value chain market and activities. Three geographical factors are represented in this step:

1. Production distribution by upazila
2. Travel time to access to processing centers
3. Travel time to commercialization including: a) market for domestic consumption, and b) export location for international markets

Using the products identified (Chapter 1) and sociodemographic conditions of women (Chapter 2), the objective of this section is to identify spatial economic structure in a territorial aspect by diagnosing geographical routes of three phases of value chains, including: 1) production, 2) transformation, and 3) commercialization of products regarding dairy, fisheries and floriculture. Table 11 explains indicators used to define the three value chain steps, and the data used.



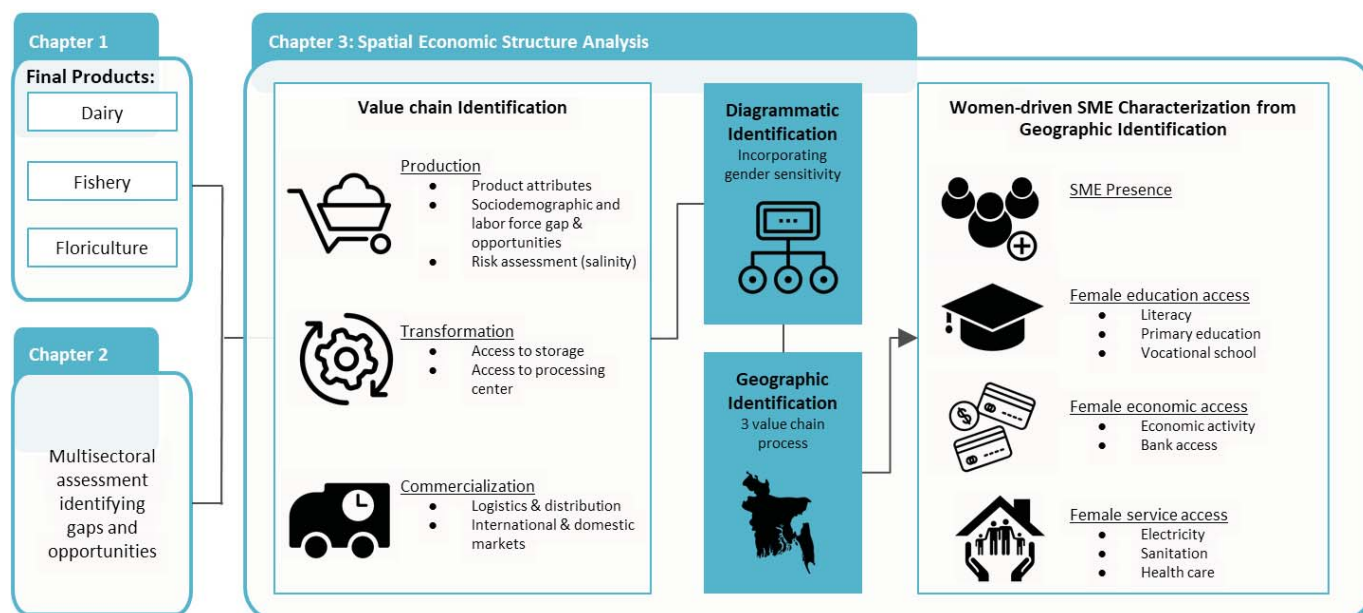


Figure 50. Diagrammatic description of value chain, developed from chapter 1 and chapter 2

Source: GeoAdaptive (2017)

Value Chain Step	Indicator	Data Source
<b>Dairy</b>		
Production	Number of cattle per upazila	Bangladesh Agricultural Yearbook, BBS 2016
Transformation	Travel time to chilling center	BRAC Dairy- Data includes location of transformation centers identified and georeferenced by GeoAdaptive; and collected through a field visit in November 2017
	Travel time to collection center	
Commercialization	Travel time to markets	GeoAdaptive 2017
	Travel time to export ports	LGED 2017, OSM 2016
<b>Fishery</b>		
Production	Number of fish production from wild catching, hatchery, and feed per upazila	Bangladesh Agricultural Yearbook, BBS 2016
Transformation	Travel time to fishery processing (chilling and processing) firms	Bangladesh Frozen Foods Exporters Association (BFFEA) 2017
Commercialization	Travel time to markets	GeoAdaptive 2017
	Travel time to export ports	LGED 2017, OSM 2016
<b>Floriculture</b>		
Production	Flower production by Zila	Bangladesh Agricultural Yearbook, BBS 2016
Transformation	Travel time to flower processing center-Godkhali bazaar, Jhikargasa, Jessore	GeoAdaptive 2017
Commercialization	Travel time to local sales retail	GeoAdaptive 2017
	Travel time to export port	LGED 2017, OSM 2016

Source: GeoAdaptive (2017)

Table 11. List of indicators and sources used for spatial value chain



Image by GeoAdaptive

# Dairy

As highlighted in chapter 1, the Bangladesh economy is primarily driven by agriculture. Especially in rural economies, livestock is an essential component to ensure steady household income. Representing a key product of livestock, the demand for dairy products grew 10% per year from 2011 to 2012 (Bangladesh Investment Development Authority [BIDA], 2012). Some of the reasons for growth are the rapid increase in population, the spread of education, and growing nutrition awareness. Therefore, the need for developing the dairy industry, especially in rural areas, has been recognized.

## Women in Dairy

Based on on-site interviews with women in Jessore, those who are focused on homestead dairy farming have expressed interest in receiving training to understand how cow feed and vaccination relates to high yields. In general, women in Bangladesh are burdened with domestic and homestead labor, while unequal division of labor limits their mobility outside the home. For the livestock sector, women in rural Bangladesh are generally responsible for dairy care and production rather than the processing (CARE, 2015). Furthermore, there are no formal livestock property rights for women, which inhibit them from owning cattle and from making policy recommendations.

(right) Figure 51. Three stages of dairy value chain. 1) Top: Production- Geographic distribution of heads of cattle, 2) Middle: Transformation- Travel time to dairy chilling and collection centers, 3) Bottom: Commercialization- Travel time to markets and ports

## Production

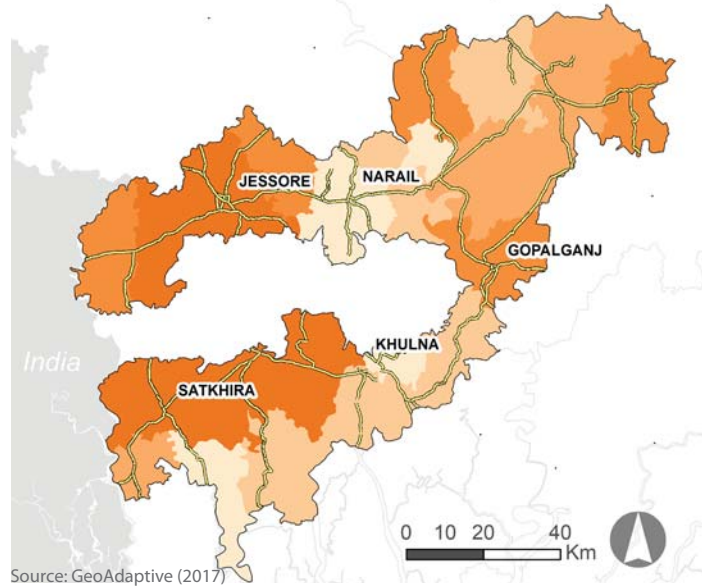
### AOI vs. National Production



52.6% of the AOI populations reside in high production areas (top 2 quantiles out of 5)



52.2% of the women in AOI reside in high production areas (top 2 quantiles out of 5)



## Processing/Transformation

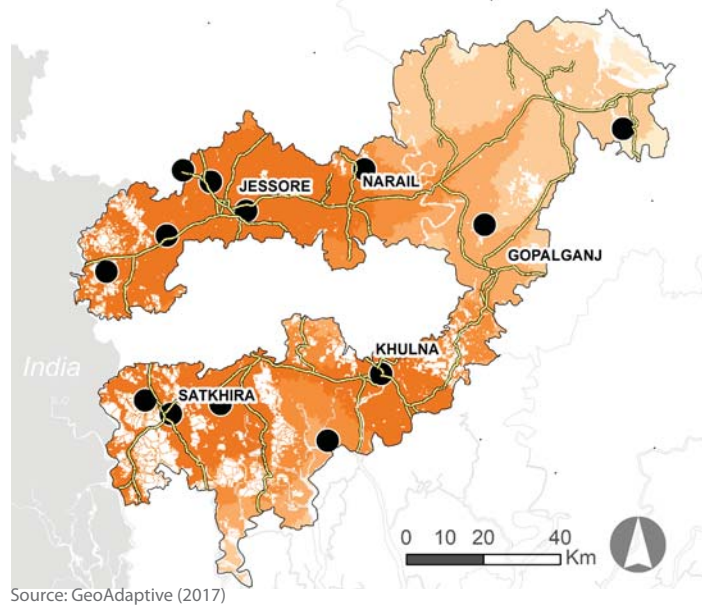
- Number of chilling centers in AOI: 6
- Number of collection centers in AOI: 7



50.5% of population takes less than an hour to access chilling and collection centers



31.4% of women in labor force (age 15 to 59) take less than an hour to access chilling and collection centers



## Commercialization

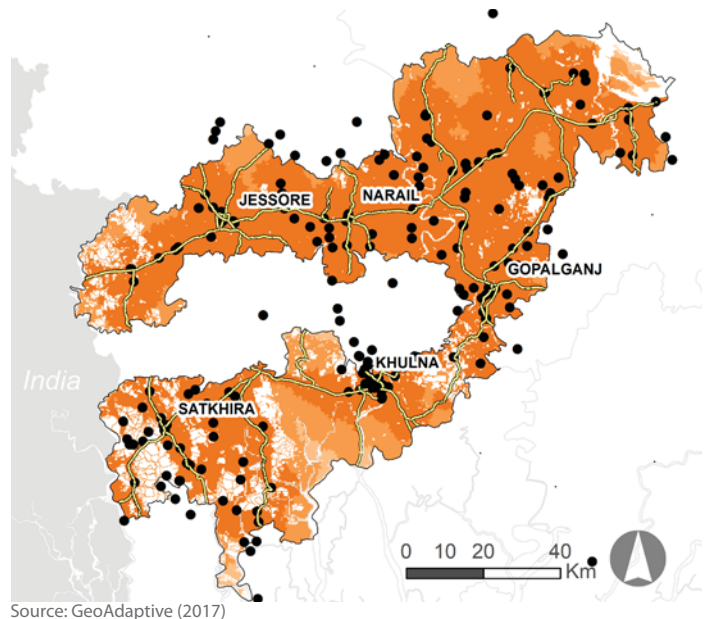
- Number of markets in AOI for domestic consumption: 227
- Number of ports in AOI for exports: 6



90.86% of population takes less than an hour to access commercialization points



65.0% of women in labor force (age 15 to 59) take less than an hour to access commercialization points



## Diagrammatic Value Chain Representation

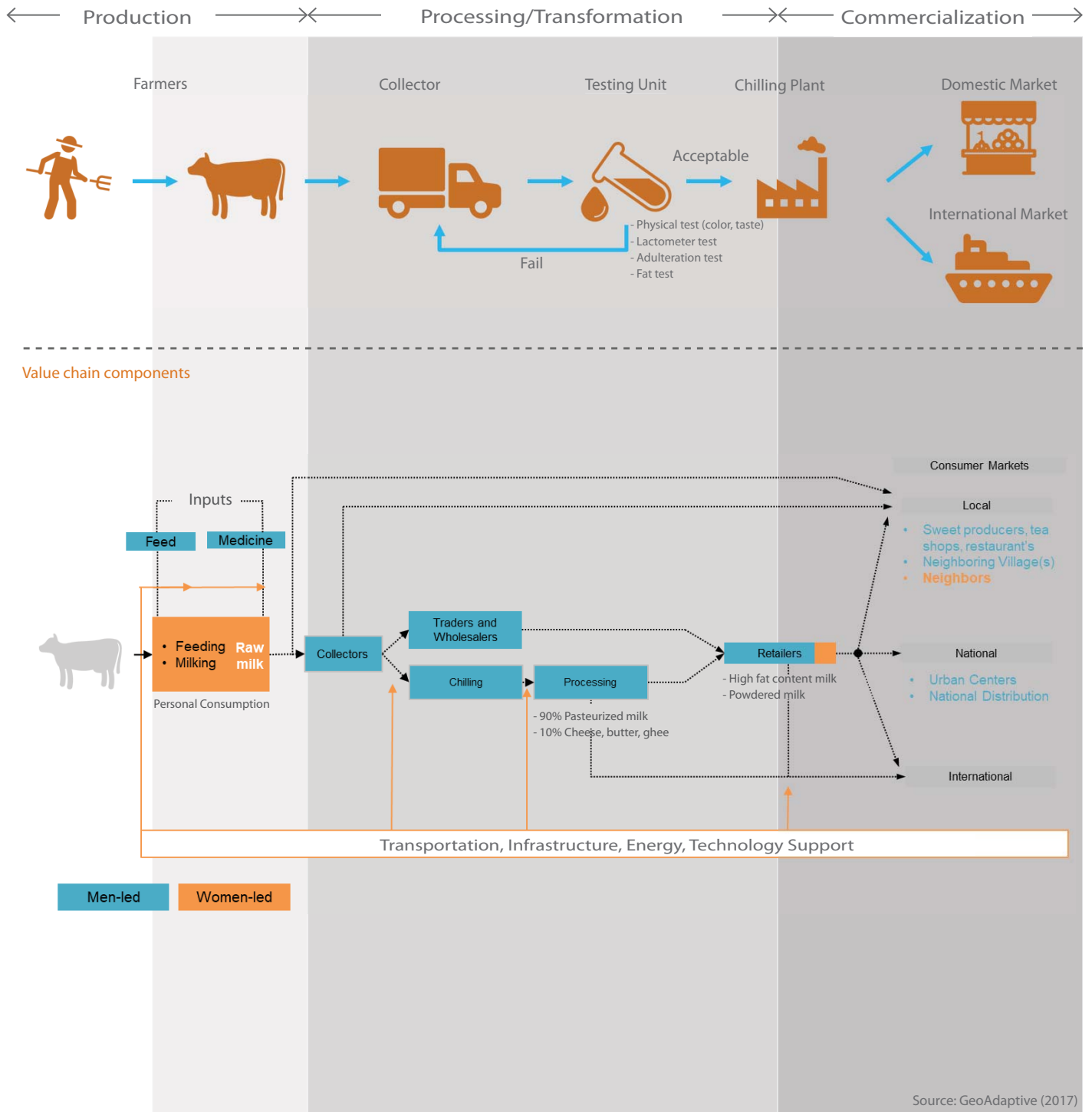
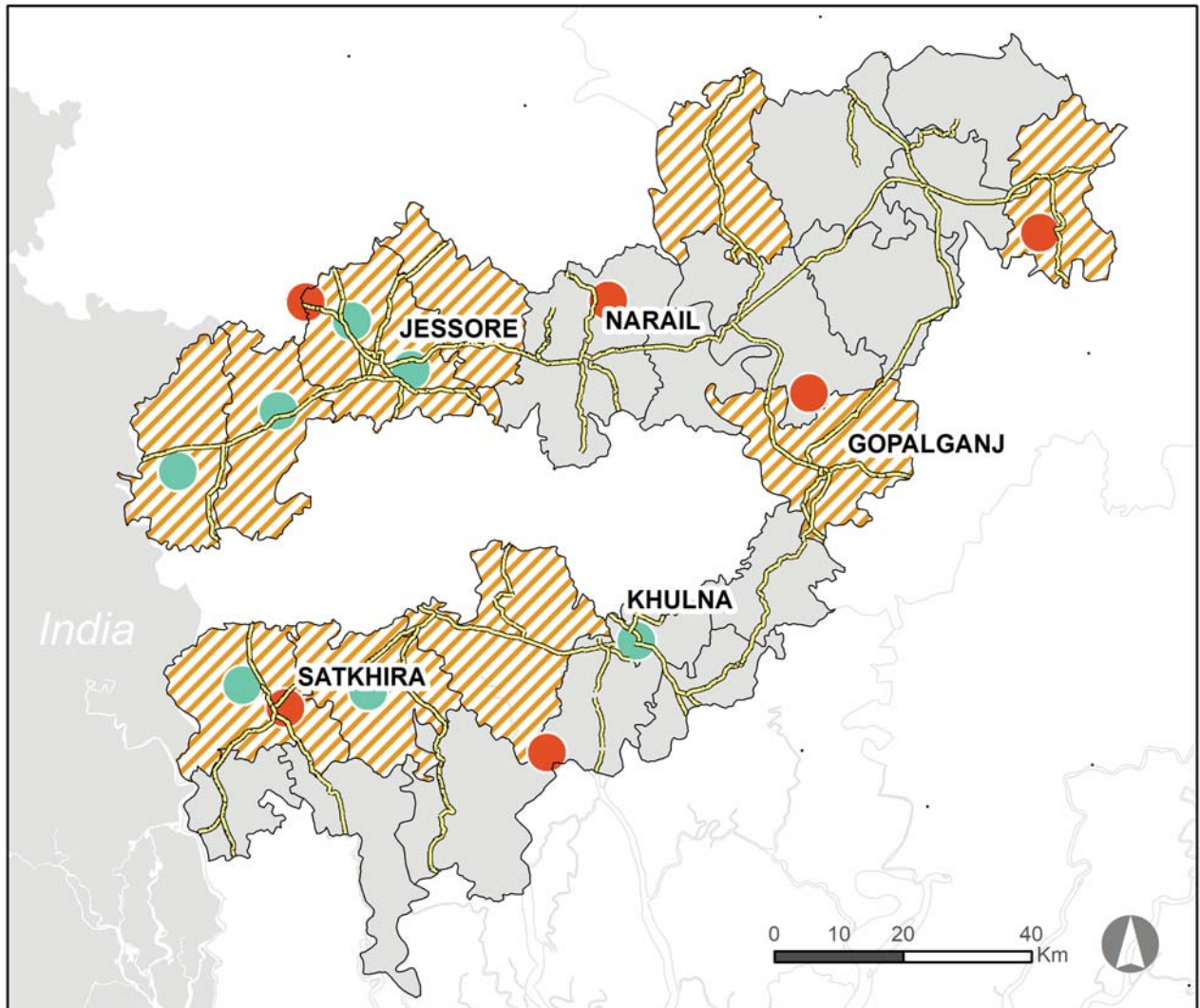


Figure 52. Diagrammatic value chain for dairy products

## Spatial Value Chain Representation



Source: GeoAdaptive (2017)

### Barriers to Entry for Women Entrepreneurial Activities

1. Current dairy commercialization channels centralized processing of milk for final consumers in Dhaka
2. Limited technical training in how to grade dairy products according to quality
3. Limited technical training in how to chill dairy products for collection points
4. Women's participation in the value chain mostly consists of independent women producers providing dairy products to established enterprises
5. Limited regulatory and training infrastructure to integrate women into later stages of the value chain

Figure 53. Spatial value chain for dairy products in AOI. 10 Upazilas with high dairy production are mainly in Jessore, Satkhira, and Gopalganj. These areas had more than 24,683 heads of cattle in 2011, which are two top quantiles out of five of the whole AOI. These areas also show high concentrations of processing and exporters including chilling point/centers and land ports.



# Fisheries

Image by GeoAdaptive

Bangladesh has rich inland waters and river systems that enable capture fisheries and aquaculture production. However, due to recent natural hazards and climate change, the natural suitability for raising fish is becoming limited, and aquaculture ventures are gradually being replaced by related activities such as hatcheries, fish nurseries, and fingerling production. Jessore district is known as a central area for hatchling production, and about 75 hatcheries were active as of 2017. As artificial aquaculture has increased, technical training and support has become key to growth in fish production and future business enterprises.

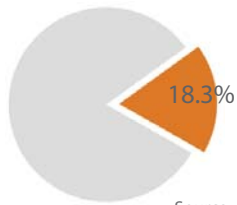
## Women in Fisheries

While the fishery sector is traditionally dominated by men working on a full-time basis, women are taking a prominent role in small-scale fisheries by using ponds at their homesteads. According to FAO (2017), women have about 1.4 million jobs in the aquaculture, however, their involvement is more confined to activities such as making fishing nets and maintaining equipment. Women in Bangladesh are also involved in aquaculture production activities. However, women's contributions are unrecognized and actual benefits from their involvement are rarely assessed (Ahmed, Halim, and Sultana, 2012). During the field visit in Jhikargacha Jessore, the project team was informed that the major roadblock to women participating in fish production is their inability to own the property, and to physically access to the site. Also, women have limited access to credit and fish processing technologies. Without training and support, women traders suffer from pre- and post-harvest losses.

(right) Figure 54. Three stages of fishery value chain. 1) Top: Production- Geographic distribution of fishing count, 2) Middle: Transformation- Travel time to fish chilling and processing centers, 3) Bottom: Commercialization- Travel time to ports

## Production

### AOI vs. National Production



539,119 fisheries in AOI  
out of 2,952,730

Source: Bangladesh Agricultural Yearbook (BBS, 2016)



49.8% of the AOI populations  
reside in high production areas  
(top 2 quantiles out of 5)



35.8 % of the women in AOI  
reside in high production areas  
(top 2 quantiles out of 5)

## Processing/Transformation

- Number of fishery chilling centers in AOI: 8
- Number of fishery processing centers in AOI: 38



50.6 % of population takes less  
than an hour to access chilling  
and processing centers



31.5 % of women in labor force  
(age 15 to 59) take less than  
an hour to access chilling and  
processing centers

## Commercialization

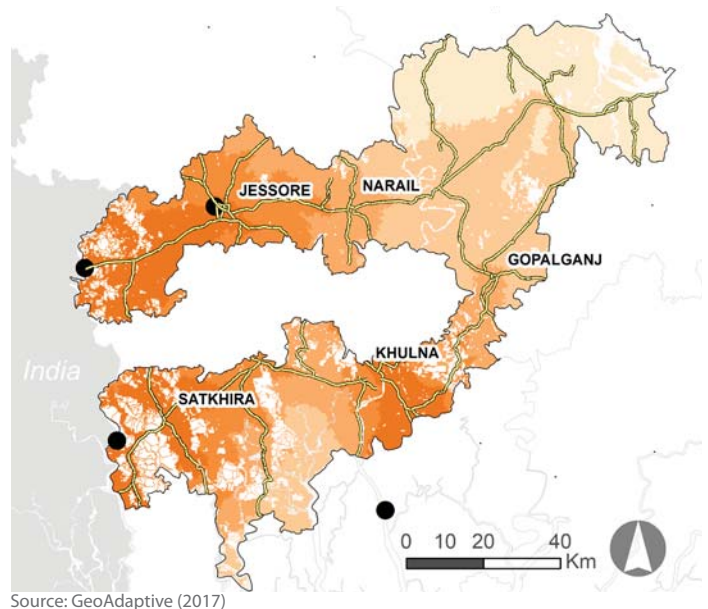
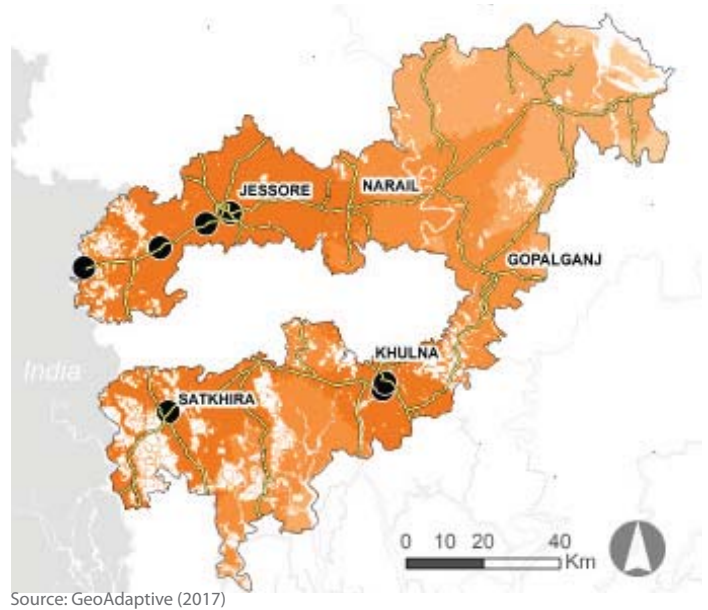
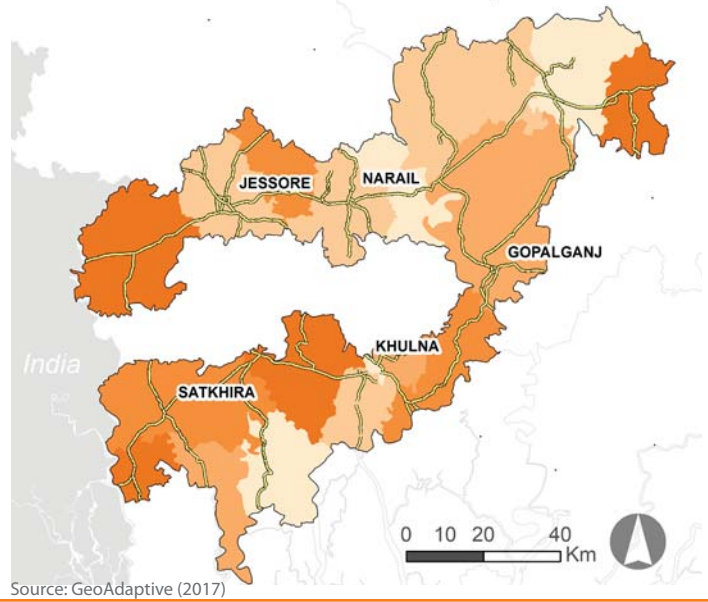
- Number of ports in AOI for exports: 6



51.1 % of population takes  
less than an hour to access  
commercialization points



31.6 % of women in labor force  
(age 15 to 59) take  
less than an hour to access  
commercialization points



## Diagrammatic Value Chain Representation

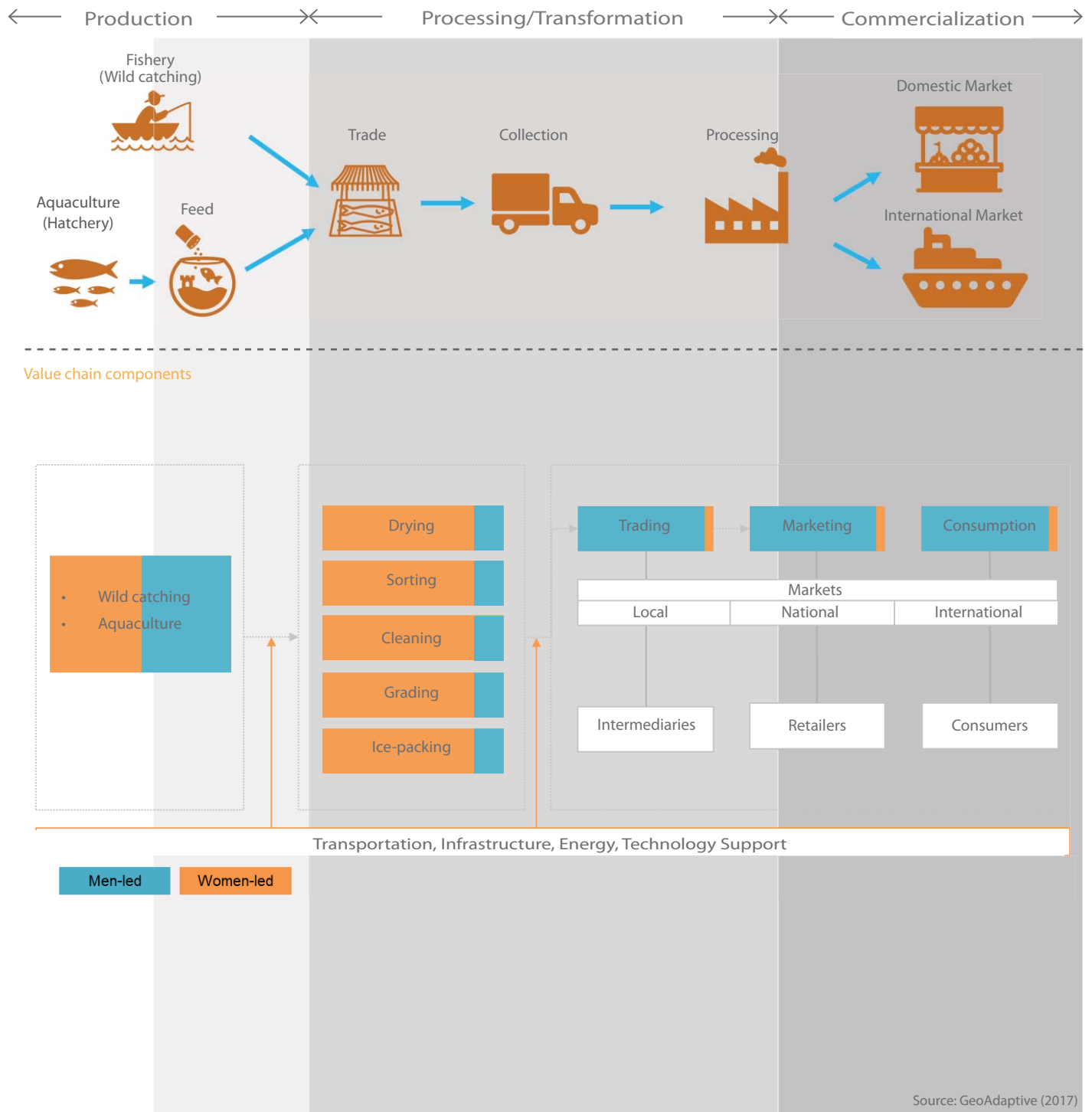
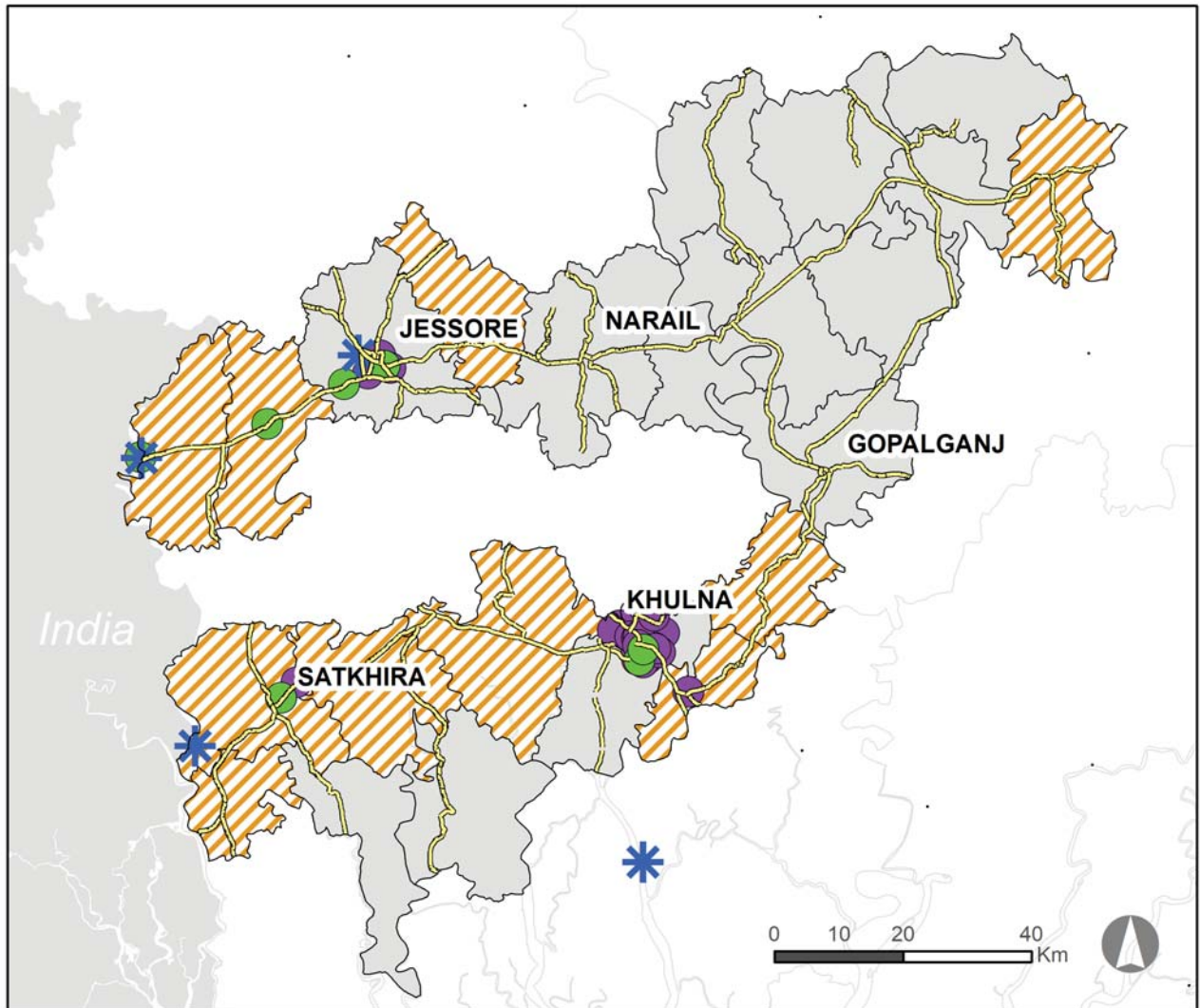


Figure 55. Diagrammatic value chain for fishery products



## Spatial Value Chain Representation



Source: GeoAdaptive (2017)

### Barriers to Entry for Women Entrepreneurial Activities

1. Cost of fish production for export is too high. Exporters prefer shrimp because profit margins are higher
2. Value-added activities in the region are occurring at fishery exporting centers, which primarily focus on shrimp\*
3. Number of cold storage that support consumption in domestic and international markets is limited
4. Most of the participation of women occurs at final stage of the rearing process in fisheries
5. Affordable feed is one of the challenges affecting actors across the value chain, not only for the production but also to improve transformation and commercialization of the value chain process

Figure 56. Spatial value chain for fishery products in AOI. 10 Upazilas with high fishery production are mainly in Jessore, Satkhira, and Khulna. These areas have more than 4,286 fisheries in production in 2011, which are two top quantiles out of five of the whole AOI. Also, Jessore and Khulna upazilas show less than an hour travel time to the processing and export centers on average

\* One of the barriers for women in processing phase of fishery (e.g. shrimp) value chain is due to the inequality. According to UN Industrial Development Organization, women workers in shrimp factories in Khulna earn 46 USD per month on average, which is only 61% of what men earn. Many women working in shrimp processing/exporting centers are employed as temporary labor contractors, without social benefits, privileges, and no chance to become permanent workers. Also, many women in rural areas are experiencing difficulties in migrating to urban industrial areas. Retrieved from: <https://www.unido.org/news/gender-focused-training-courses-empower-women-bangladeshs-shrimp-production-sector>



# Floriculture

Image by GeoAdaptive

Cut flower export in Bangladesh has grown over 10% as it has emerged as an industry of high potential for entrepreneurs. Further expansion would broaden the country's range of exports (Chowdhury and Khan, 2015), given that cultivation of flowers is reported to give 3-5 times more return on investment than would be obtained from rice cultivation (Haque, et al., 2012). The Southern Delta, which includes the AOI, is known as the hub of the floriculture in Bangladesh, where approximately 85 percent of total production occurs, especially in Jhikargacha upazila in Jessore. About 10,000 hectares of land have been assigned for flower cultivation, and about 15,000 people are involved directly or indirectly in floriculture as their source of livelihood (Mou, 2012). While Godkhali in Jhikargacha is the largest wholesale flower market in Bangladesh, flower-marketing is still not fully organized. Major trade and commercialization centers are found in Dhaka, and substantial trading also occurs in Chittagong, which indicates that one of the key challenges in flower processing and wholesaling is the absence of a cold chain and transit access for local farmers in Jessore.

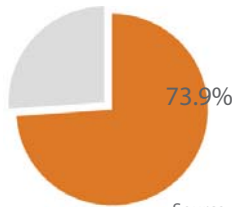
## Women in Floriculture

As mentioned, about 15,000 people are involved in floriculture industry, and women are well represented at almost all levels of the value chain process, including production, assembling, as well as working in retail markets. Although women are less exposed to the market compared to men, flower assembly, beyond simple production, is known to create off-farm employment for women.

(right) Figure 57. Three stages of floriculture value chain. 1) Top: Production- Geographic distribution of flower production count, 2) Middle: Transformation- Travel time to floriculture processing center (Godkhali), 3) Bottom: Commercialization- Travel time to wholesale and rural markets

## Production

### AOI vs. National Production



6,281MT in AOI  
out of 8,497 MT

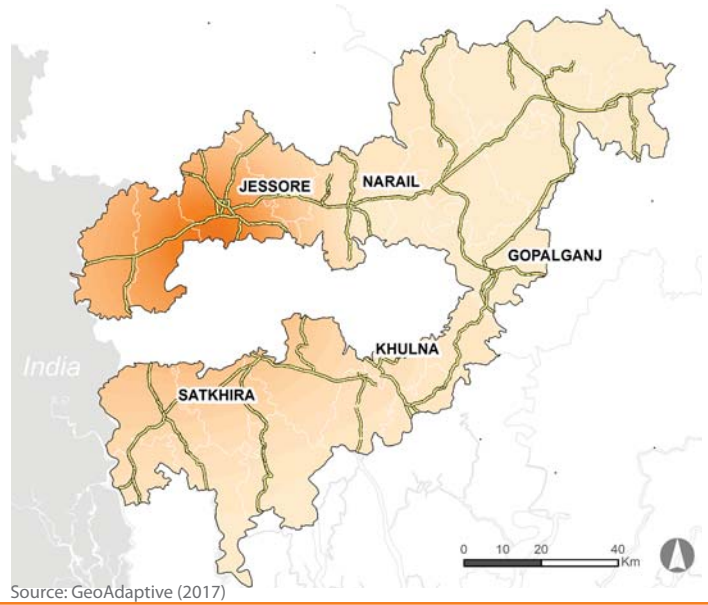
Source: Bangladesh Agricultural Yearbook (BBS, 2016)



9.7 % of the AOI populations  
reside in high production areas  
(top 2 quantiles out of 5)



10.8 % of the women in AOI  
reside in high production areas  
(top 2 quantiles out of 5)



Source: GeoAdaptive (2017)

## Processing/Transformation

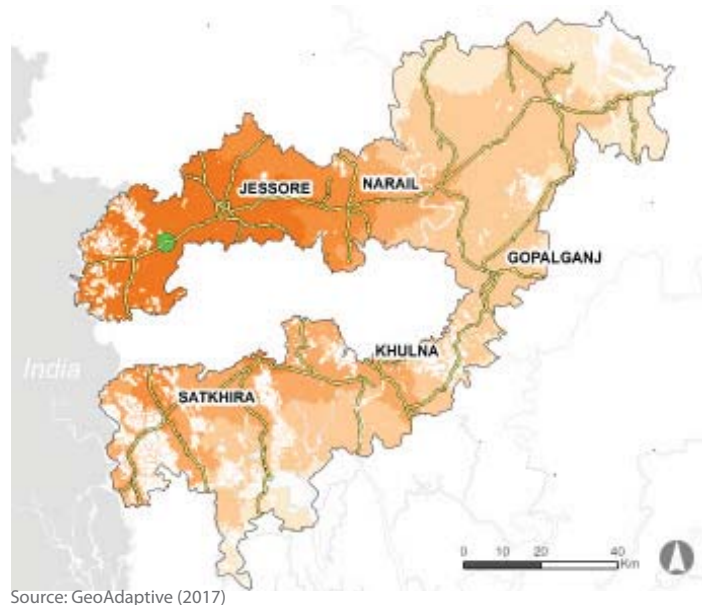
- Number of floriculture processing centers: 1



13.0 % of the AOI populations  
reside in high production areas  
(top 2 quantiles out of 5)



8.4 % of the women in the  
labor force (age 15 to 59) have  
less than an hour access to  
processing centers



Source: GeoAdaptive (2017)

## Commercialization

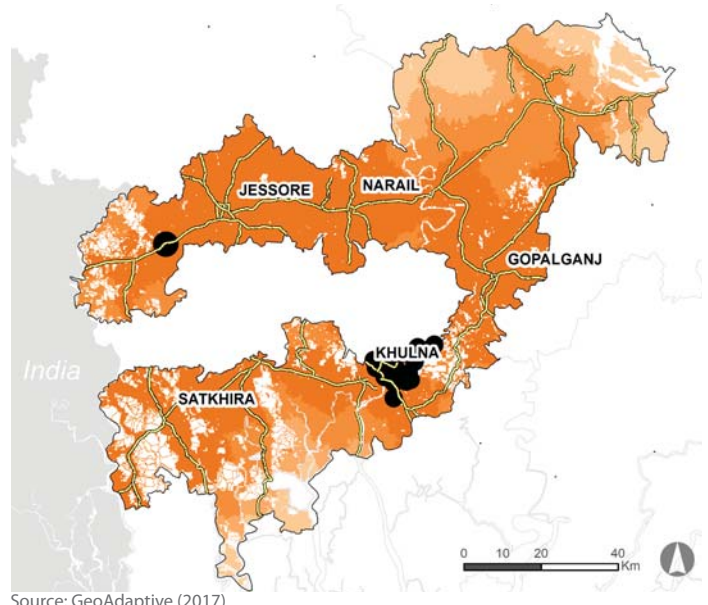
- Number of floriculture wholesale markets in AOI: 1
- Number of rural markets in AOI: 7



63.8 % of the AOI populations  
reside in high production areas  
(top 2 quantiles out of 5)



39.8 % of the women in the  
labor force (age 15 to 59) have  
less than an hour access to  
commercialization points



Source: GeoAdaptive (2017)

## Diagrammatic Value Chain Representation

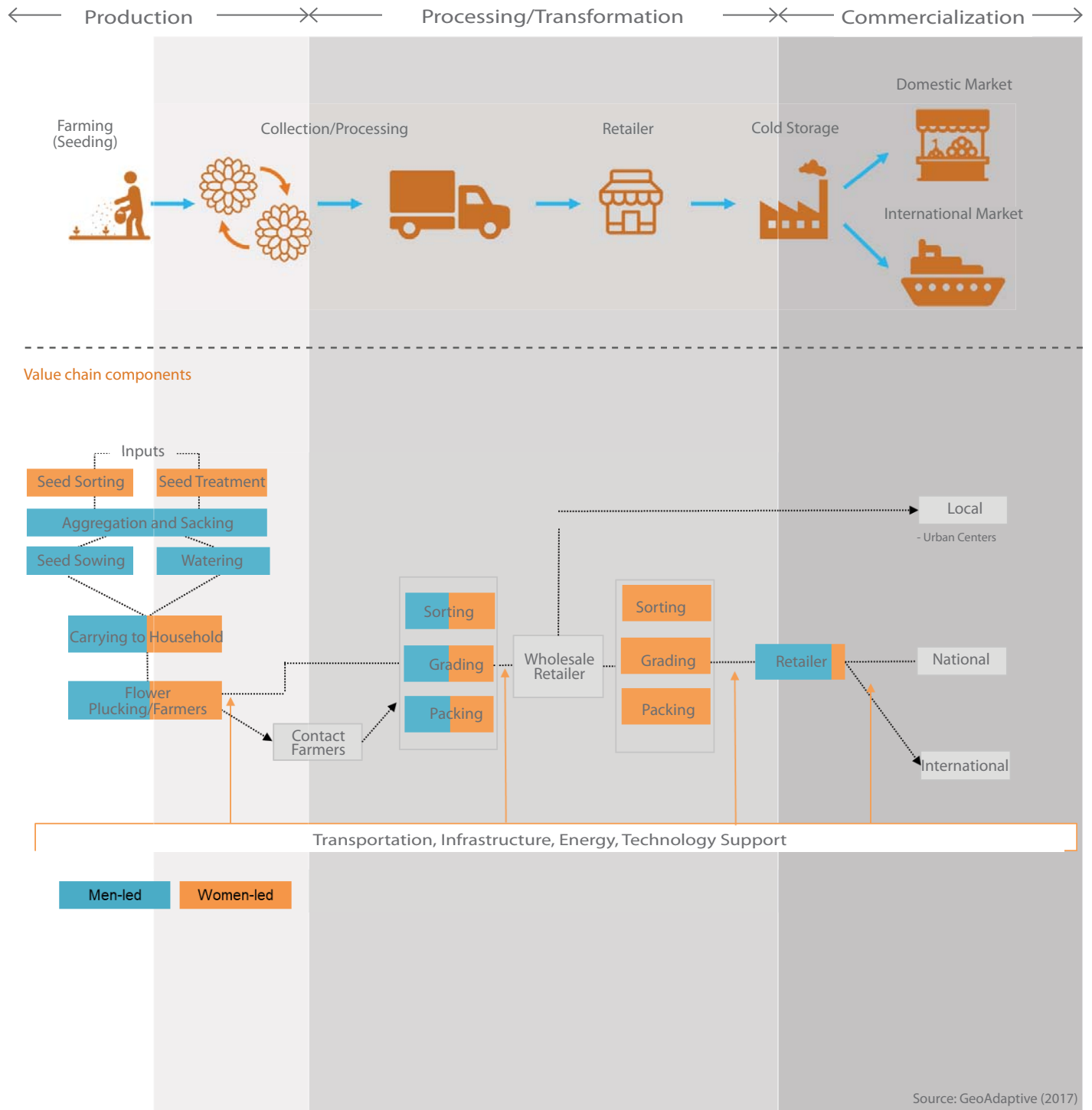
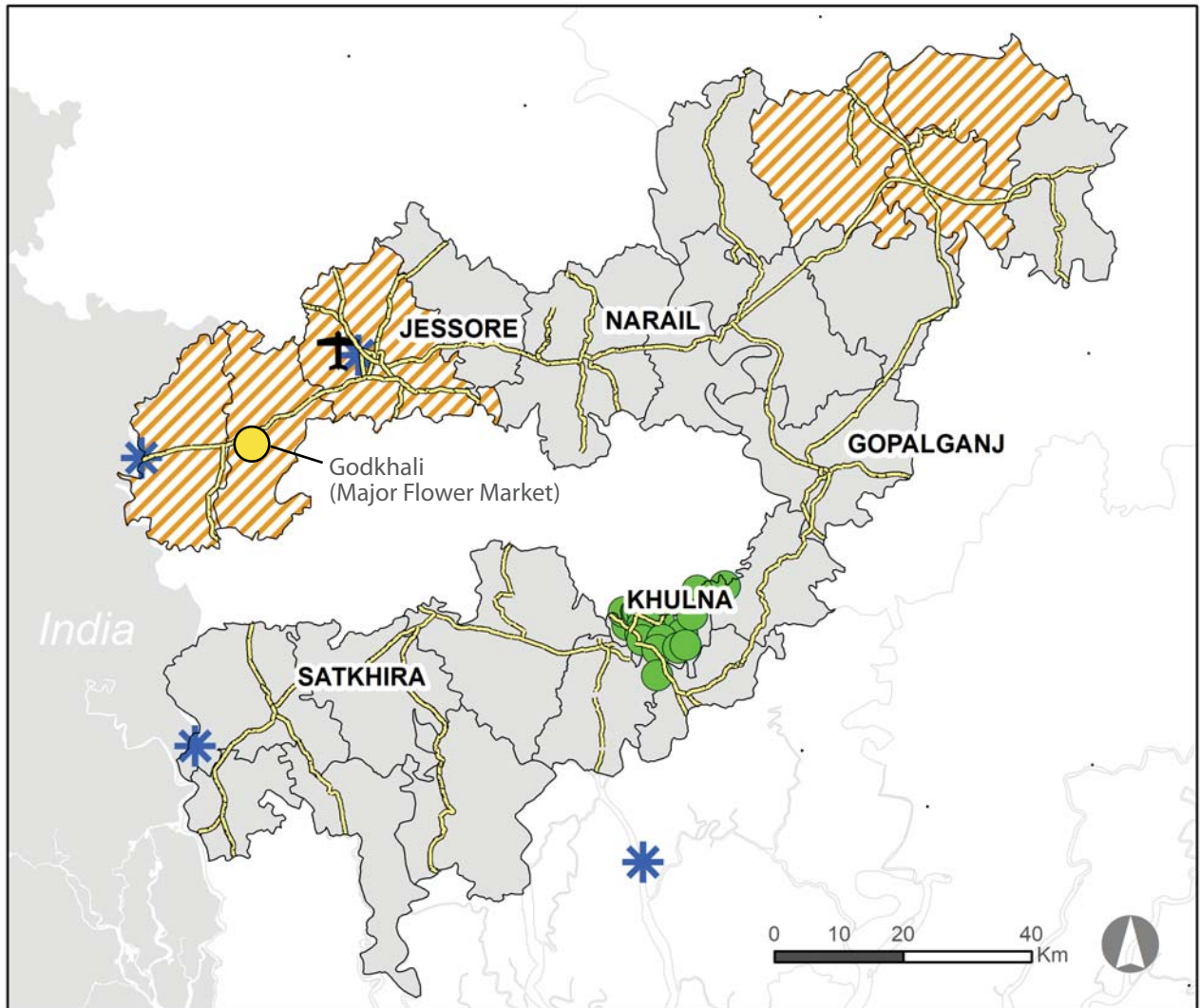


Figure 58. Diagrammatic value chain for floriculture products

## Spatial Value Chain Representation



Source: GeoAdaptive (2017)

### Barriers to Entry for Women Entrepreneurial Activities

1. There is a local demand for flowers in the region. The majority of the demand stems from Dhaka with producers far removed from the final consumer
2. No added value methods such as selling flowers designed in arrangements
3. Need improvements in packing of flowers for transport to prevent quality loss
4. Women participation in the floriculture value chain is limited to production
5. Number of cold storage facilities are limited and there are no facilities used for flowers at this point

Figure 59. Spatial value chain for floriculture AOI. Production is dominant in three upazilas in Jessore district: Jhikargacha, Jessore, and Sarsha. The other upazilas with highest top two quantiles out of five includes Sadarpur, Bhanga, and Nagarkanda where major highways pass through Dhaka that has majority of flower demands. While Godkhali is a major flower market in AOI, Khulna Sadar has about 12 rural markets for regional demands.

## Box 5. Environmental Challenges

### OVERVIEW

The natural environment of southwestern Bangladesh is subject to multiple drivers of change, both seasonally and over longer time scales. Due to the region's location in the Ganges River delta, as well as to the influence of the annual monsoon, changes in water quantity and salinity are among the most pressing concerns. The balance of fresh and salt water is constantly fluctuating, from daily tide cycles to seasonal influx of Himalayan meltwater and monsoon rains, with long term geologic and climate processes also causing sea-level rise, which threatens to submerge low-lying countries like Bangladesh.

Human activity has also significantly contributed to environmental changes and promoted resilient agriculture against environmental changes in southwestern Bangladesh. Transboundary water management has resulted in more extreme changes in river flow, primarily due to the Farakka Barrage, which diverts a significant proportion of water during the dry season, causing rivers such as the Gorai to dry up and higher salinity water to migrate further inland (Mahmuduzzaman et al., 2014). Pumping of groundwater has also impacted shallow aquifers, which have become more saline due to agricultural activity, requiring deeper wells for crop irrigation. The issue of polders is also becoming more urgent, as these protected low-lying areas are critical to ensuring the viability of rice production and aquaculture, yet deferred maintenance of the infrastructure and poorly-coordinated water management have reduced the functionality of these resources.

This combination of natural and human influence has accelerated the degradation of natural resources in the study region, and exacerbated food and water insecurity. The growing threat of sea-level rise and other climate-induced changes to seasonal weather patterns threatens to further impact the population and productive sectors of southwestern Bangladesh. Additional adaptation measures will be necessary to ensure the sustainability of livelihoods and reduce human and economic risk over the coming decades.

### ENVIRONMENTAL MONITORING

Monitoring of environmental change has been essential to tracking the magnitude and rate of changes in water and land resources. Precipitation, surface water, and groundwater are measured throughout the year by the Bangladesh Water Development Board and other entities, using a network of monitoring stations. Salinity measurements are also collected at points throughout the country's coastal zone, and organizations, such as the Institute of Water Modelling, use these readings to represent the distribution of the salinity gradient, both under current conditions and considering climate change projections (CSIRO, 2014).

Sea-level rise is another urgent issue that is monitored by the Climate Change Cell (CCC) of the Bangladesh Department of Environment. According to their "Assessment of Sea Level Rise on Bangladesh Coast through Trend Analysis" (CCC 2016), tide gauges and satellite altimetry are being used to track long-term trends. Over the past 20 years, stations in the Ganges tidal floodplain have recorded a range of sea-level change from -19 mm/year (decreasing) to 37 mm/year (increasing). Surges from tropical storms are another source of temporary influx of saline water in the coastal region, which can linger long after the storm has dissipated. Coupled with rising sea level, the impact of storm surge is anticipated to become more severe in the future (Mahmuduzzaman et al., 2014).

## SALINE INTRUSION

Although salinity levels in the surface water of southwestern Bangladesh have always fluctuated throughout the year, monitoring has shown that the extent of brackish water continues to reach further into the coastal zone, affecting fresh water supplies for drinking and irrigation, as well as agriculture and aquaculture production. Multiple factors contribute to the increasing salinity, and can roughly be broken down into three main categories, specifically:

1. environmental changes in the quantity and seasonal flux of fresh water,
2. increased influx of ocean water, and
3. human interventions in the natural distribution of water.

The Figure below describes several of the key issues in each category. Of particular concern are the transboundary water management issues and the long-term threat of rising sea levels which is expected to permanently inundate large sections of the coastal zone.

According to analysis by the Institute of Water Modeling, surface water salinity levels in excess of 10 ppt, unsuitable for freshwater aquaculture and rice cultivation, already affect large areas of Satkhira and Khulna during part of the year. By 2050, projections show these levels extending further north into Gopalganj and Narail, as shown in Figure 60 (CSIRO, 2014).

Short term increases in soil and surface water salinity also occur due to irrigation practices, storm surge, and intentional flooding of land for saltwater shrimp cultivation. Groundwater pumping is also accelerating the rate of saline intrusion into subsurface water resources. While the levees and sluice gates used to control water levels within polders help to mitigate the effects of increasing salinization, degradation of the infrastructure has reduced the effectiveness of these structures. Saline intrusion is also a threat to wild freshwater fish, which represent an important source of protein for impoverished families in southwestern Bangladesh.

Suitable habitat for more salt-tolerant species is expected to expand, but these fish may be slow to populate new areas of brackish water, resulting in an overall decline of the capture fisheries in the region (Dasgupta, et al. 2017).



Figure 60. Factors contributing to saline intrusion

## MITIGATION AND ADAPTATION

The issue of saline intrusion is being addressed on multiple fronts. Projects such as Blue Gold, a collaboration between the government of the Netherlands and the government of Bangladesh, are working to improve water management within polders, increasing rice yield and providing training on livestock and aquaculture production. There is also a trend to shift from brackish water prawn cultivation to saltwater shrimp, which takes advantage of the elevated salinity in some polders, but can also accelerate the salinization process.

One of the projects with the greatest potential to control the seasonal flux of salinity, as well as ensuring more consistent supply of fresh water for irrigation, is the proposed Ganges Barrage. This large-scale water control structure would maintain a more constant supply of freshwater in the Ganges delta, but investment in the project is on hold as of the time of this report.

Additional adaptation measures will be necessary to ensure sustained economic growth, food security, and water security in response to continued environmental change. Sea-level rise will require relocation of populated areas and certain productive activities closer to the coast. Salt tolerant crops and aquaculture species can also help replace lost production in areas where salinization cannot be mitigated.

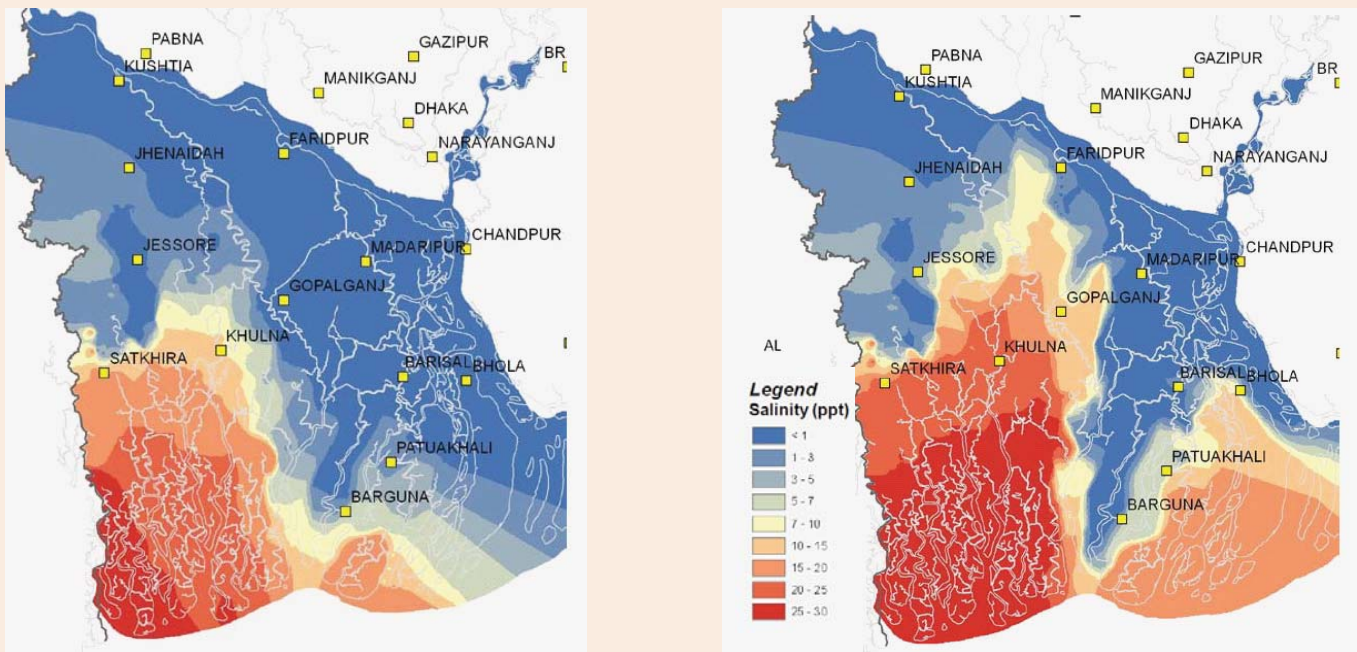


Figure 61. Saline intrusion under current conditions (left) and projected through 2050 (right), Source: Commonwealth Scientific and Industrial Research Organization (CSIRO), 2014



# Chapter 4

---

## Enterprise and Focal Zones Identification

## BACKGROUND AND OBJECTIVES

By deploying representations of the spatial patterns of the value chain, the project team was able to: 1) understand where gaps and opportunities are clustered related to the products, and 2) assess functionality of the value chain process for each product. In this regard, the objective of this section is to apply results from the geographic value chain analysis to present economic clusters and evaluate barriers to SME participation for women entrepreneurs. Lastly, this section identifies geographic candidate areas with potential interventions to promote women-driven SME development. Results in this section serve two purposes:

- Assess value chain functionality and agglomerations
- Evaluate barriers to women-driven SME participation

Following the spatial value chain identification, the functionality assessments allow detection of the economic opportunities to improve supply chain performance, and relationships among three value chain phases for each product. By geographically overlaying the functionality for the three selected products, this step identifies and characterizes agglomerated economic zones. The areas of agglomerated productive opportunity represent key locations with the highest potential for application of targeted interventions, ranging from project sites to capacity building programs, that can improve opportunities for women to participate in SMEs.

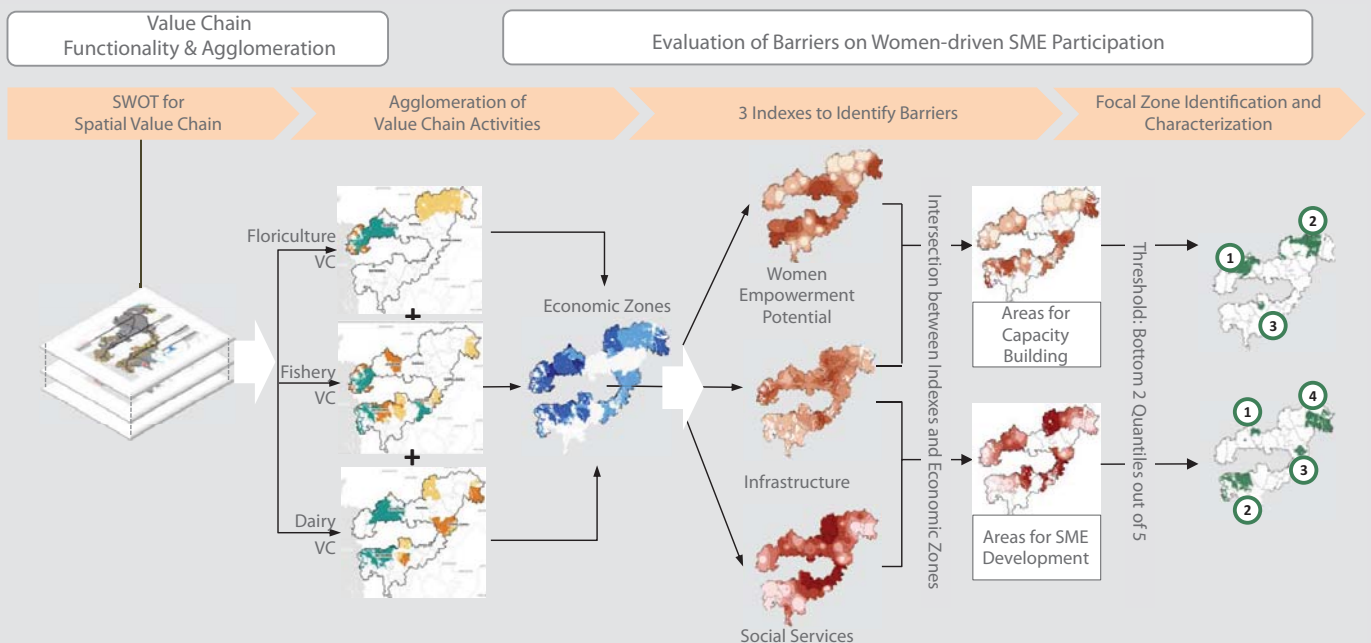


Figure 62. Overview method to identify: 1) agglomerated economic zones from value chain results, and 2) candidate sites for capacity building and SME development by evaluating barriers based on women-driven conditions, Source: GeoAdaptive (2017)

## METHODOLOGY

Enterprise and focal zones were identified in order to understand areas that need improvements on territorial barriers of value chains to strengthen the capacity of rural women. Methodologically, this section covers three steps explained below:

1. Agglomeration of value chain activities to identify economic zones for all three agricultural products
2. Creation of three indexes to understand barriers for women-driven SMEs
3. Identification and characterization of focal zones

### 4. 1. Value Chain Functionality and Agglomeration

The distribution of the value chain was identified through the analysis of overlapping spatial patterns of three value chain phases: 1) areas with top 2 of 5 quantiles for production, 2) an hour travel time threshold for processing and transformation centers, and 3) an hour travel time threshold for the commercialization location. These results were obtained through the application of GeoAdaptive's cell-based transportation network analysis that considers the quality of transportation network linkages to identify the best route to the destinations.

### 4. 2. Evaluation of Barriers to Women-driven SME Participation

The diagnosis and evaluation of the barriers for women to participate in SMEs was done using multiple variables that enable identification of the intensity and spatial extent of the problem. Three indexes were created to evaluate three conditions: 1) women's empowerment potential, 2) social services, and 3) infrastructure. This allowed the research team to evaluate current barriers to the establishment of women-driven SMEs in the AOI and to determine the extent of the functional areas of value chain. Table 11 explains the indicators used, and all variables were equally weighted.

Index	Indicator	Data Source
Women Empowerment Potential (WEP)	Travel time to banks	OSM 2016
	Travel time to vocational training centers	OSM 2016
	Literacy rate	BBS 2011
	Women of working age	BBS 2011
Social service	Travel time to hospitals	LGED 2017
	Education availability: ratio between population and education centers	LGED 2017, BBS 2011
	Total number of population with primary education	BBS 2011
	Education quality: student-to-teacher ratio	LGED 2017, BBS 2011
Infrastructure	Travel time to the nearest public transit stops	LGED 2017
	Percentage of household with electricity access	BBS 2011
	Road density (Km/population)	LGED 2017

Source: GeoAdaptive (2017)

Table 12. List of indicators and sources used to create three indexes to evaluate barriers to women in SME participation

## 4.1. Value Chain Functionality and Agglomeration

Figures 63, 64, and 65 represent the overlap of each value chain phase, which depict promising economic opportunities and gaps:

- Green clusters - show optimized economic opportunities, where production is within the top two quantiles and is less than one hour from both transformation and commercialization centers.
- Orange clusters - show areas experiencing challenges in commercialization because of the limited transportation network. However, these clusters have high production rates and are less than one hour from transformation centers.
- Yellow clusters - show areas where production is functioning well; however, there are challenges in accessing transformation and commercialization centers that are more than one hour away.

These results show the need for infrastructure improvements that can achieve high yield from production by improving connectivity to areas with limited accessibility to transformation and commercialization locations. As depicted in the three functionality representations, Jessore performs the highest across three products among major zilas in the AOI. Satkhira is observed to have high functionality for fishery and dairy products; while east Satkhira has limited transportation access to commercialization centers.

### Dairy Value Chain Functionality

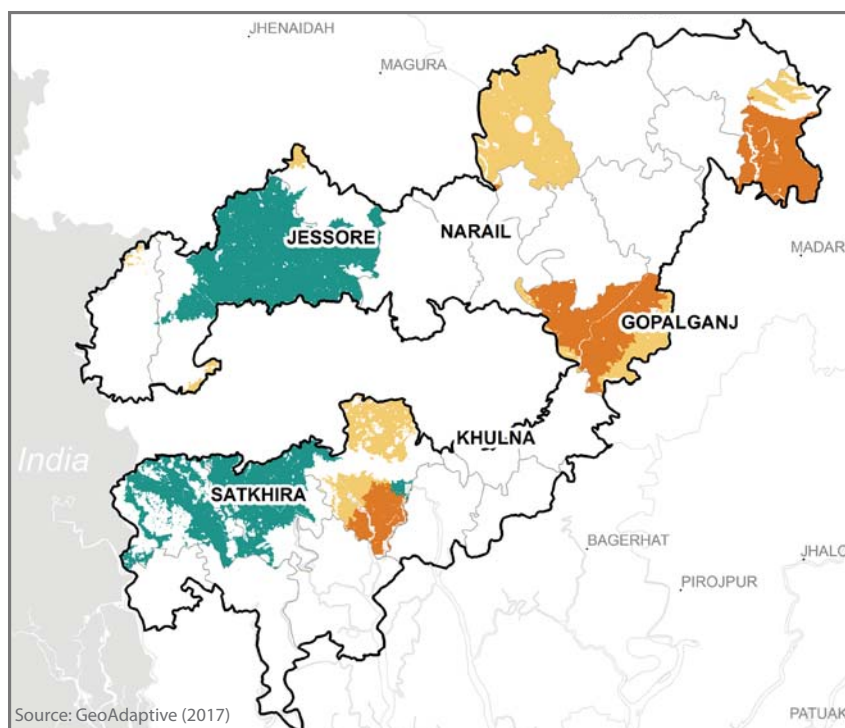
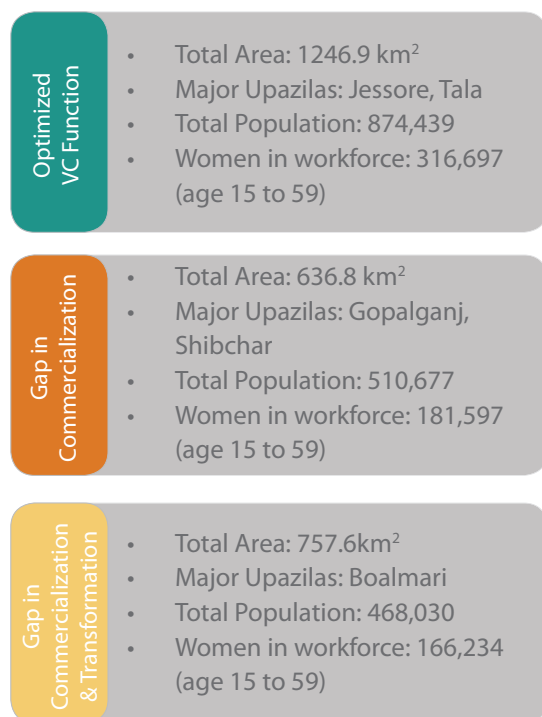


Figure 63. Functionality of dairy spatial value chain in AOI. About 14.2% (1246.9 sq.km.) of AOI are highlighted green, predominantly in Jessore and Tala upazilas, representing areas with high production and with less than an hour's access to transformation and commercialization centers for dairy products. About 12.8 % (874,439) of the AOI population resides in these areas (green) and about 36.2% (316,697 out of 874,439) are women of ages 15-59

## Floriculture Value Chain Functionality

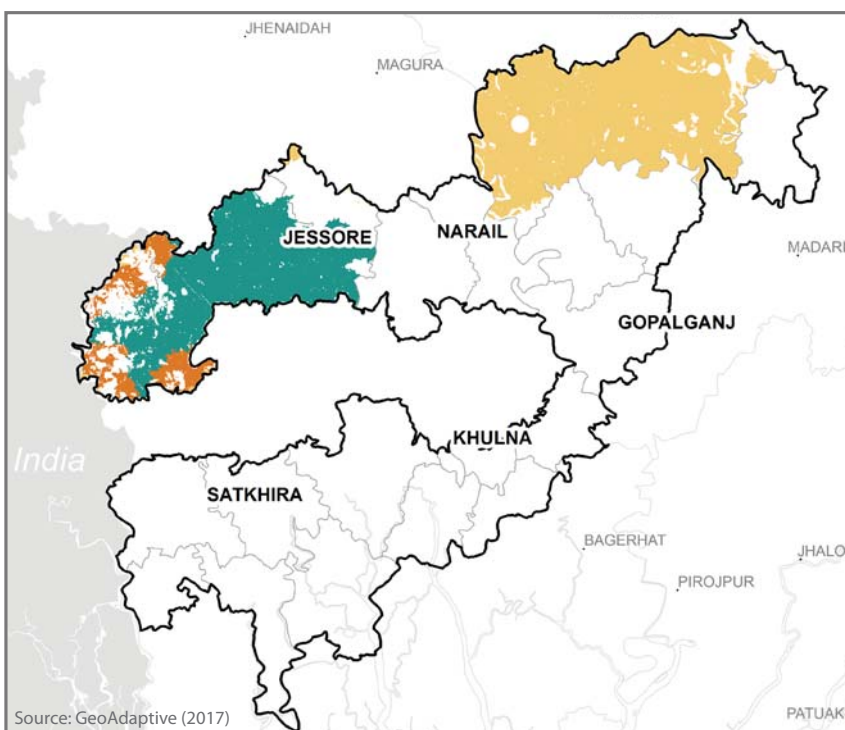
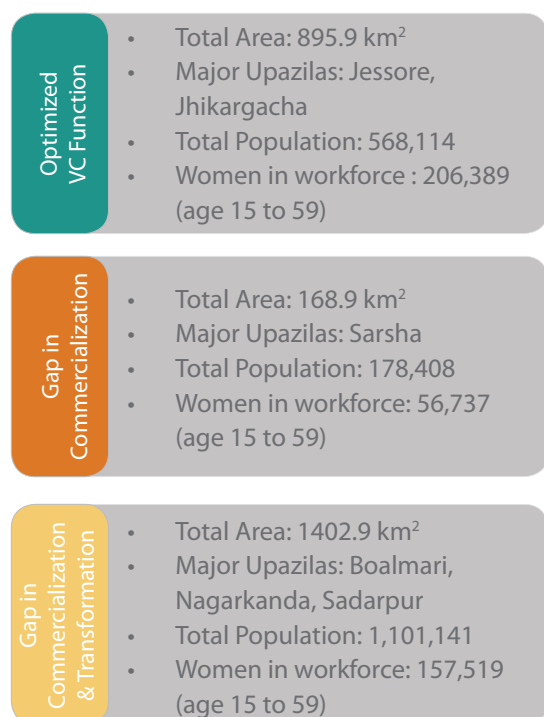


Figure 64. Functionality of floriculture spatial value chain in AOI. About 10.2% (895.9 sq.km.) of AOI are highlighted green, predominantly in Jessore and Jhikargacha upazilas, representing areas with high production and with less than an hour's access to transformation and commercialization centers for floriculture products. About 8.3 % (568,114) of the AOI population resides in these areas (green) and about 36.3% (206,389 out of 568,114) are women of ages 15-59

## Fishery Value Chain Functionality

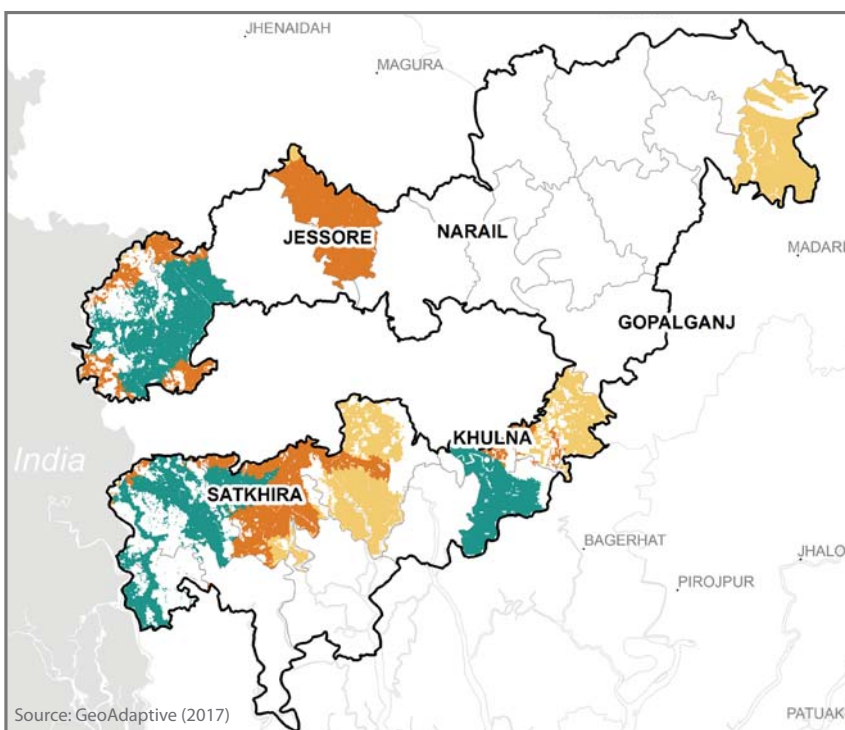
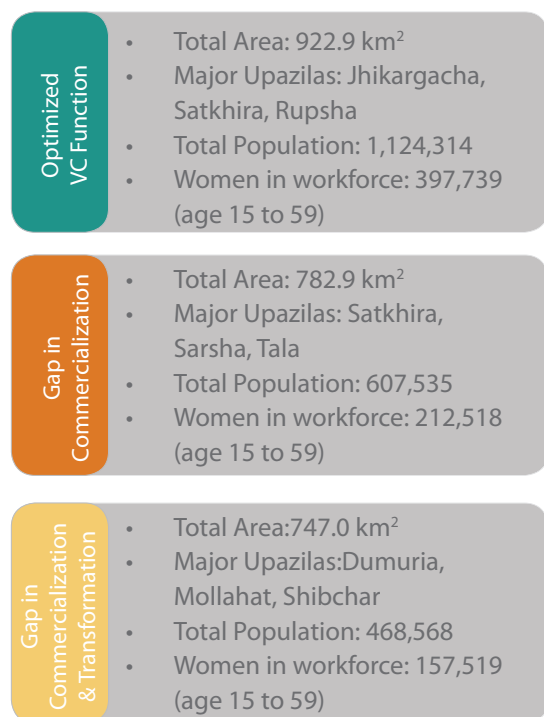


Figure 65. Functionality of fishery spatial value chain in AOI. About 10.5 % (922.9 sq.km.) of AOI are highlighted green, predominantly in Satkhira, Khulna, and Batiaghata upazilas, representing areas with high production and with less than an hour's access to transformation and commercialization centers for fishery products. About 16.5 % (1,124,314) of the AOI population resides in these areas (green) and about 35.4% (397,739 out of 1,124,314) are women of ages 15-59

## 4.1. Value Chain Functionality and Agglomeration



Figures 66 and 67 and descriptive tables show the agglomerated economic opportunities of these three products and how each value chain phase functions. Agglomerated functionality analysis suggests and selects areas where there is high functionality for these three products. From the agglomerated result, about 2.8% of population has been identified to have the opportunity to be involved in all three products, while 25.2% and 24.2% of populations are exposed to two products, respectively. Also, the results of this agglomerated value chain for the three products suggest that the AOI has at least four clusters of economic zones:

1. Northeastern portion of the AOI including Faridpur and Madaripur, where production of all three products are high
2. Jessore, where flower and dairy are the dominant products; while production of all three products are high
3. North of Khulna embracing Gopalganj, where fishery products are dominant. These areas have less than an hour's access to dairy chilling centers/plants
4. Satkhira- where dairy products are dominant, this area has high fishery production as well

From a strategic point of view, this analysis is designed as a fundamental step before identifying barriers related to women-driven SMEs and supporting infrastructure such as transportation and social services for human development. In this context, the concentration and geographic aggregation of economic activities associated with the selected and proposed products will allow locational targeting of interventions that promote the intersectoral agglomeration of economic opportunities, and coordination of investments to support economic benefits in the region.

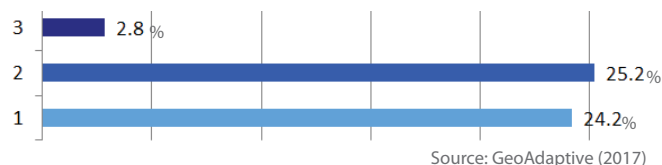
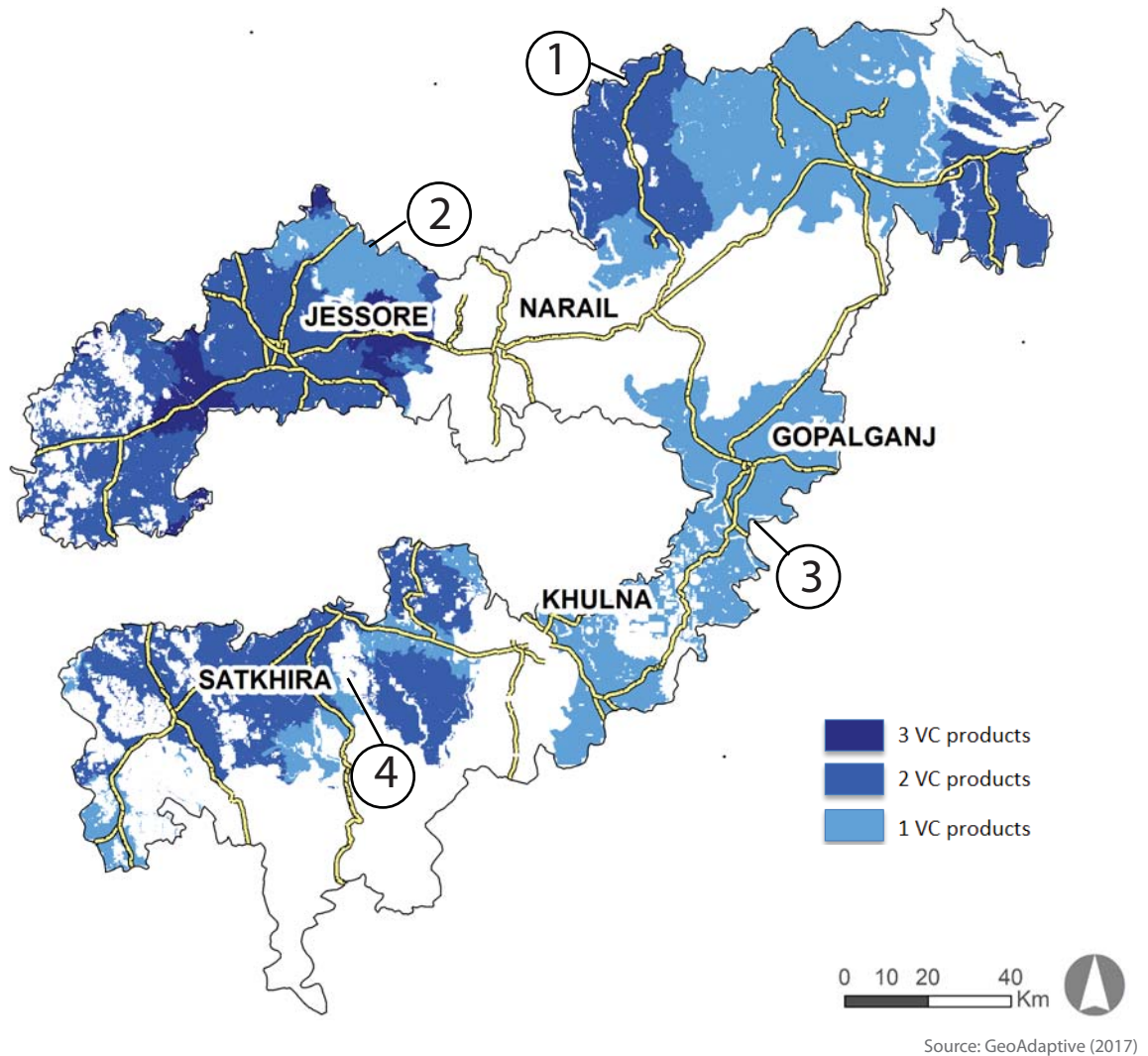


Figure 66. Percentage of population in areas where number of products are agglomerated from spatial value chain analysis



### 1. Madaripur

	Production	Transformation	Commercialization
 Floriculture	●	●	●
Dairy	●	●	●

### 2. Jessore

	Production	Transformation	Commercialization
 Floriculture	●	●	●
Dairy	●	●	●

### 3. Khulna to Gopalganj

	Production	Transformation	Commercialization
 Fisheries	●	●	●
Dairy	●	●	●

### 4. Satkhira

	Production	Transformation	Commercialization
 Fisheries	●	●	●
Dairy	●	●	●

Figure 67. Economic zones identified from agglomerated value chain analysis. Four areas are highlighted including: 1) Madaripur, 2) Jessore, 3) Khulna to Gopalganj, and 4) Satkhira region

## 4.2. Three Indexes for Barrier Evaluation

As mentioned, three indexes were created to verify the accumulation of barriers in the study area, specifically for women’s economic empowerment and also for supporting factors, such as social services and infrastructure. This allows key questions to be addressed from the perspective of public policy and decision-makers:

- Where are the areas with potential for women’s economic empowerment that need capacity building programs?
- Where are the areas with built environment challenges that hinder SME development?

### Women’s empowerment index

Similar to the economic zones identified, Madaripur, Satkhira, Narail, and Khulna are observed to have the highest potential for women’s empowerment. These areas are reported to have higher banking access for women, while an average of only 1.7% of women have banking access across the country- 9.3% of women have access to banking in Shibchar in Madaripur, 7.9% in Debhata in Satkhira, 4.5% Narail Sadar in Narail, and 3.9% in Khulna Sadar in Khulna.

### Social services index

Areas with high social services conditions are highlighted in the center of the AOI, concentrated in Khulna, Bagerhat, and Narail zilas. These areas have results consistent with the multisectoral sociodemographic assessment, which indicated that there is a high concentration of labor force opportunities in these areas. Also, women with advanced degrees are concentrated in these areas, providing further potential improvements for women’s capital development.

### Infrastructure index

Because the infrastructure index considers accessibility to major roads and public transit, areas with high performance follow the patterns of major highways. Khulna, Narail, and Jessore were highlighted, while another corridor in the direction of Dhaka is observed to have high infrastructure performance in the center of the AOI. These areas also demonstrate high electricity accessibility, with an average over 77.2%, compared to the national average of 52.6%.

### Women’s Empowerment Index

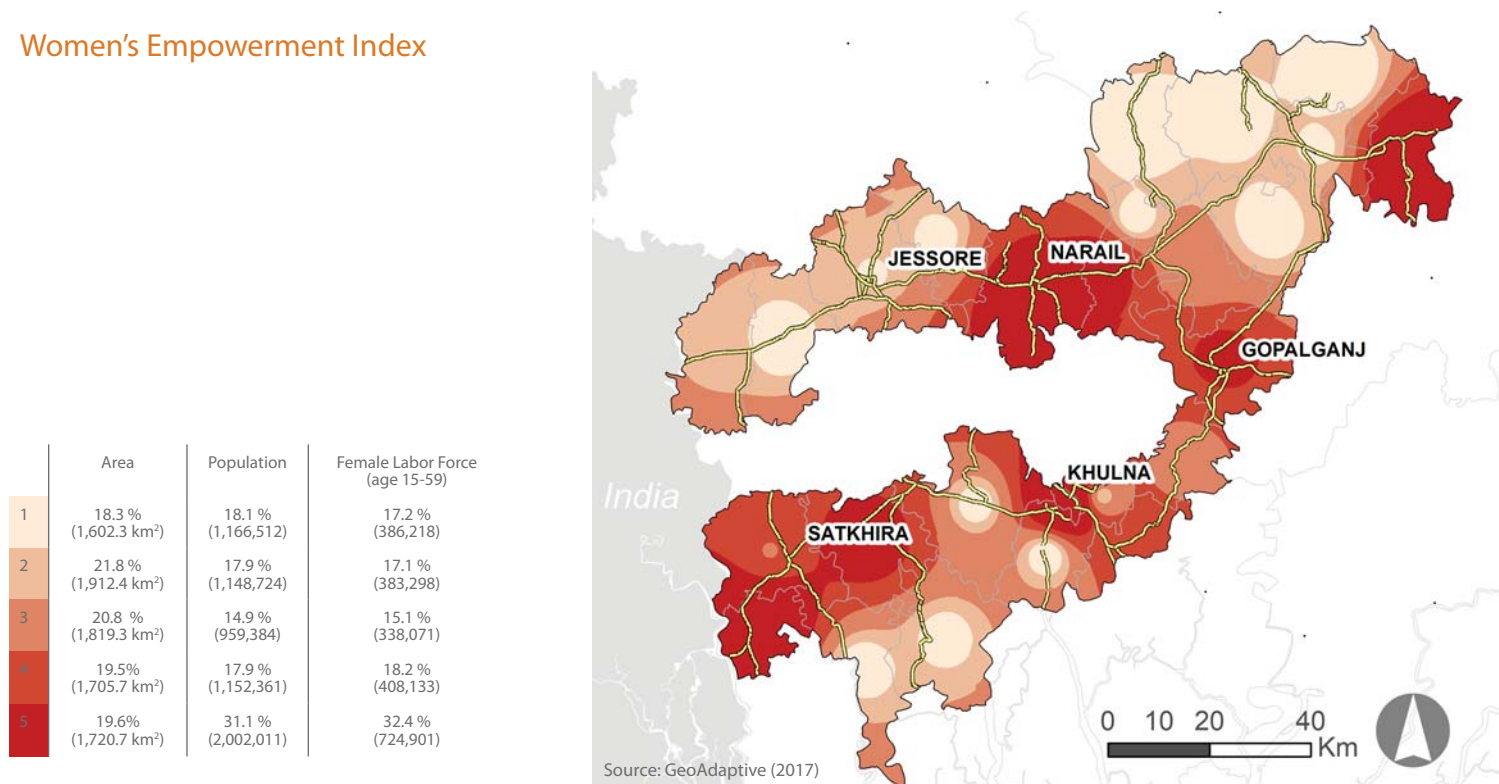


Figure 68. About 32.4% of women (aged between 15-59) are recognized to have the highest potential for women’s economic empowerment because of their high access to banking, education, vocational training, and high literacy rates. Madaripur, Satkhira, Narail, and Khulna are highlighted geographically. In particular, an average of 6.4% (Standard deviation= 2.6) of women have access to banking, while the country’s average for women is 1.7%



## Social Services Index

	Area	Population	Female Labor Force (age 15-59)
1	18.8 % (1,650.2 km <sup>2</sup> )	20.9 % (1,342,389)	18.8 % (422,921)
2	19.9 % (1,742.1 km <sup>2</sup> )	19.2 % (1,237,310)	20.1 % (452,408)
3	20.8 % (1,821.9 km <sup>2</sup> )	18.0 % (1,158,332)	18.4 % (414,405)
4	21.5 % (1,881.5 km <sup>2</sup> )	14.3 % (919,719)	15.0 % (338,873)
5	19.0 % (1,664.7 km <sup>2</sup> )	27.7 % (1,778,196)	27.8 % (626,114)

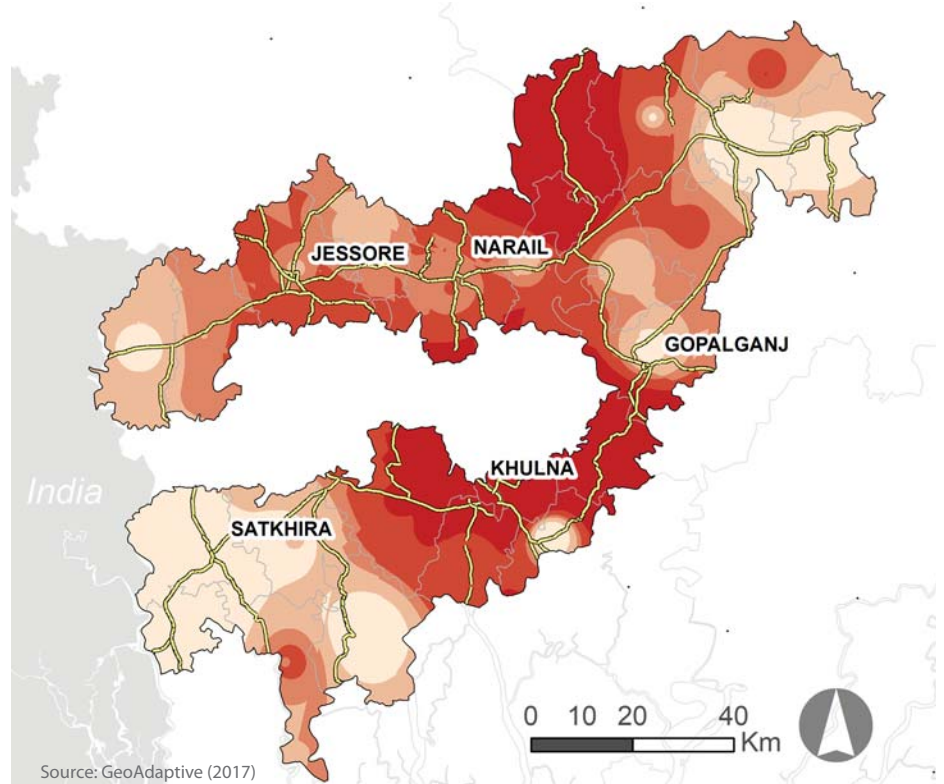


Figure 69. About 27.8 % of women (aged between 15-59) in AOI are recognized to have the highest access to social services including hospitals and education. In addition to considering the physical access to services, this index includes the meaning of education quality, represented by teacher-to-student ratio. Center of the AOI including Khulna, Mollahat, and Narail upazilas are highlighted geographically.

## Infrastructure Index

	Area	Population	Female Labor Force (age 15-59)
1	13.8 % (1,204.9 km <sup>2</sup> )	6.4 % (409,165)	30.3 % (934,590)
2	24.8 % (2,169.6 km <sup>2</sup> )	28.8 % (1,854,118)	21.1 % (651,816)
3	36.0 % (3,149.6 km <sup>2</sup> )	31.4 % (2,019,450)	22.9 % (707,010)
4	19.5 % (1,710.7 km <sup>2</sup> )	22.3 % (1,434,673)	16.8 % (517,993)
5	6.0 % (525.5 km <sup>2</sup> )	11.1 % (711,586)	8.8 % (271,919)

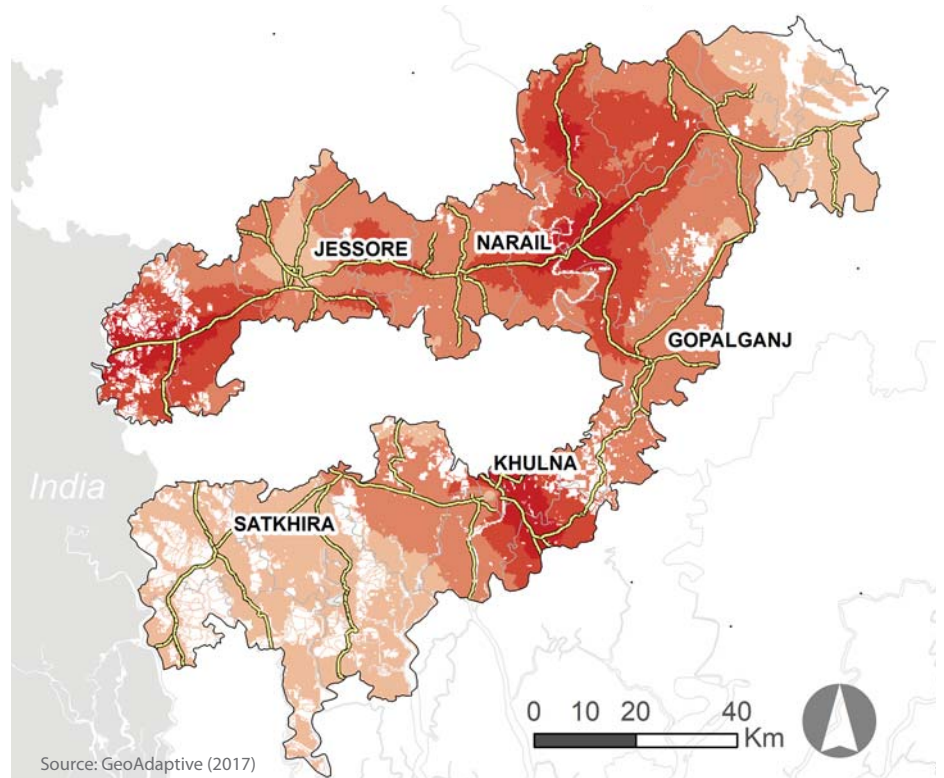


Figure 70. About 8.8% of women (aged between 15-59) receive benefits of high access to infrastructure, especially to major roads and public transit. Khulna, Narail, and Jessore are highlighted geographically, while other corridors in the direction of Dhaka are observed to have high infrastructure performance that are in the center of the AOI.



# Discussion

---

Women-driven SMEs Value Chains

# Selection of Candidate Sites

## 1 Capacity Building Efforts for Women Entrepreneurs

### From Analysis to the Selection of Focal Zones

For this study, focal areas have been chosen according to the areas where strengthening rural capacity for women could decrease the barriers of entry that women face in the existing geographical value chains of the dairy, fishery and floriculture SME sectors. The focal areas were identified as follows:

- Within the extent of the functional areas of each value chain (the economic space of all the value chains)
- The lowest two quantiles of the Women's Empowerment Index and Infrastructure index.

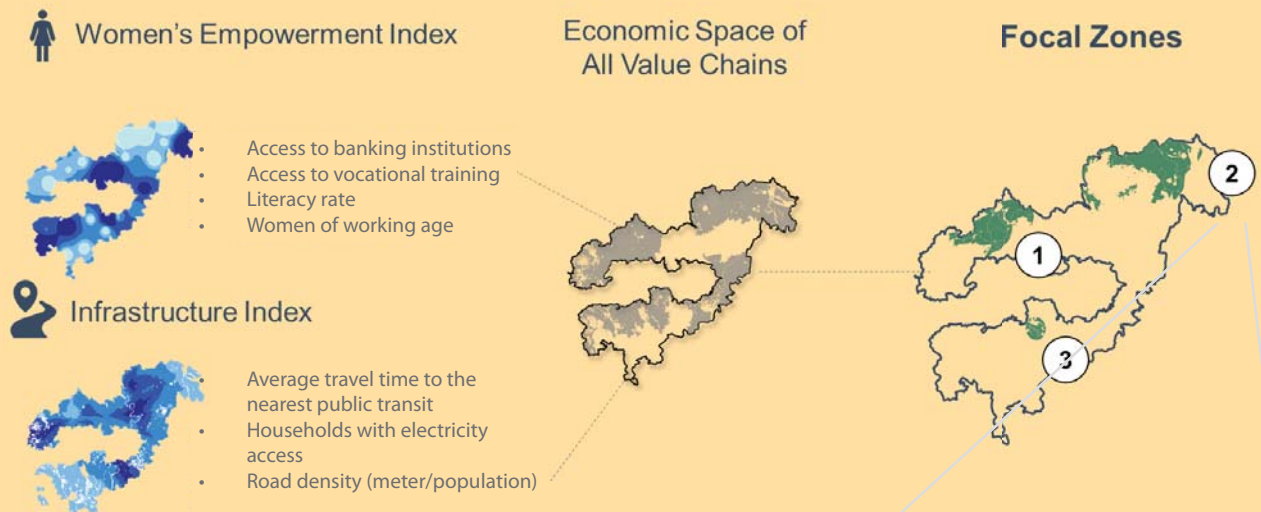


Figure 71. Identification of three focal zones for potential capacity building projects. Focal zones are based on: 1) the indexes assessing the potential of women's empowerment, 2) infrastructure supports, and 3) economic conditions that represent value chain functions of dairy, fishery, and floriculture products, Source: GeoAdaptive (2017)

### Example: Potential Capacity Development Programs



Based on the spatial indicators, capacity development programs in focal zone 2 should include training women entrepreneurs on accessing financial instruments to be able to buy flowers in bulk. This would facilitate the role of women as wholesale flower traders in a region that produces the second largest amount of flowers after Jhikargacha in Jessore



With rates of 0.1% of vocational enrollment for women, capacity development in focal zone 2 should be aimed at expanding the type of flower specialization that can be seen in Jhikargacha in order to spread the methods and profits more equitably across the area of study

Spatial Indicators	Total	%
<b>Women's Empowerment</b>		
Women with Access to Banking	1,560	0.7
Women's Literacy	84,781	38.27
Women Registered in Vocational Training	231	0.1
Women of Working Age	126,167	56.96
<b>Infrastructure</b>		
Average Time Nearest Public Transit (min)	69	N/A
Households with Access to Electricity	44,325	47.06
Road Density (M/Pop)	2.87	N/A

Source: GeoAdaptive (2017)



## 2 Support for SME Development

### From Analysis to Selected Focal Zones

Methodologically, this research provides a geospatial approach to create an index driven from: 1) transportation and electricity infrastructure, and 2) education and health services that capture the conditions that pose a barrier for a productive SMEs workforce.

By overlaying the economic zones with this index, this study creates a flexible decision-making tool, that allows stakeholders to evaluate and prioritize focal areas for SME development that are derived from a comprehensive analysis of territorial conditions.

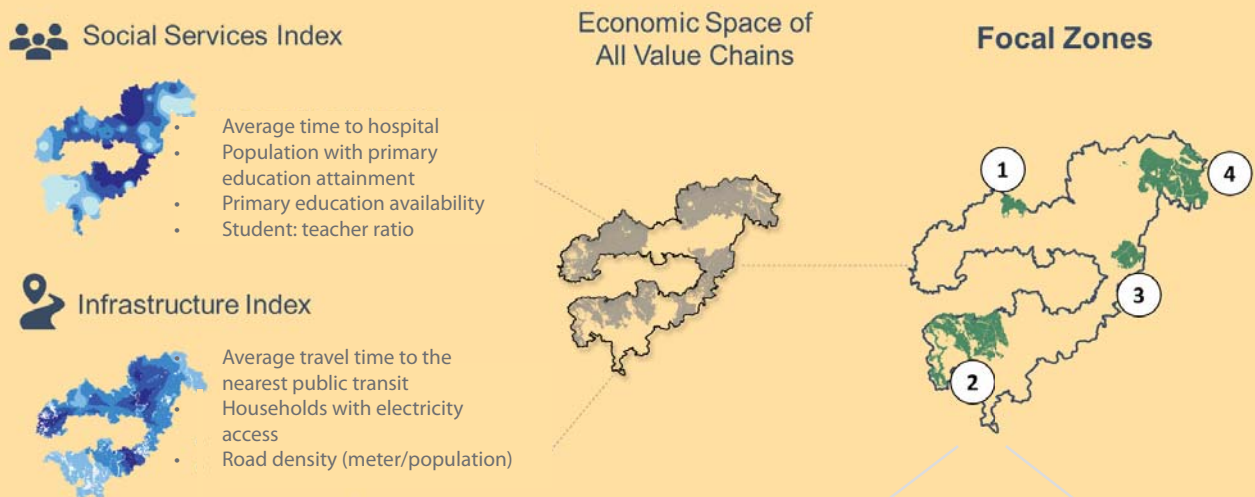


Figure 72. Identification of four focal zones for potential SME development projects. Focal zones are based on: 1) the indexes assessing social service and infrastructure conditions, 2) infrastructure supports, and 3) economic conditions that represent value chain functions of dairy, fishery, and floriculture products, Source: GeoAdaptive (2017)

### Example: Potential SME Development



Deficiency of utility services- Findings showed that access to electricity is the most serious structural bottleneck in this focal zone, where only 50.21% of households are covered; while the national average of household electricity coverage is 62.4%. Lack of access to electricity constitutes the binding constraint to decentralized growth of private investment, particularly of SMEs



Deficiency of public transportation access- With an average of 120 minutes to access public transportation, Focal zone 2 should aim to expand the public transit network based on its location on the border of India and the Ghodadanga and Bhomra corridor

Spatial Indicators	Total	%
<b>Social Service</b>		
Average Time to Hospital (min)	17	N/A
Population with Primary Education	260,583	51.83
Availability of Primary Education	281	N/A
Number of Students per Teacher	N/A	39.08
<b>Infrastructure</b>		
Average Time Nearest Public Transit (min)	120	N/A
Household with Access to Electricity	60,110	50.12
Road Density (M/Pop)	2.46	N/A

Source: GeoAdaptive (2017)

# Value Chain Diagnostics and Assessment

## Women and Value Chains in Rural Southwestern Bangladesh

Through the application of geospatial intelligence and real world validation of the study, it was determined that one of the major impediments that women-driven SMEs faced in their integration into the value chains was the limited mobility that rural women in southwestern Bangladesh experience as a result of societal expectations that women should be the primary caregivers in their households.

Figure 73 diagrammatically represents how this limited mobility in turn affects and reduces the agency and ability of women in accessing financial, educational resources that help them start SMEs in non-producer roles in the value chain. This is problematic for two reasons, the first is that women-driven SMEs are currently predominantly only found at the bottom of the value chain, where value addition activities are minimal and women receive low returns on their products. Second,

the persistence of these conditions poses a significant barrier for women SMEs to be a part of the transformation and commercialization stages of the value chain, leading to women not participating as owners in the production of agricultural goods but only as employees.

### Integrating Women into the Value Chains

The analysis has allowed for the identification of focal areas where capacity development and SME development interventions could promote the integration of women SMEs into the value chain for flowers, dairy and fisheries.

The following section will show how to promote and integrate women-driven SMEs into these value chains.

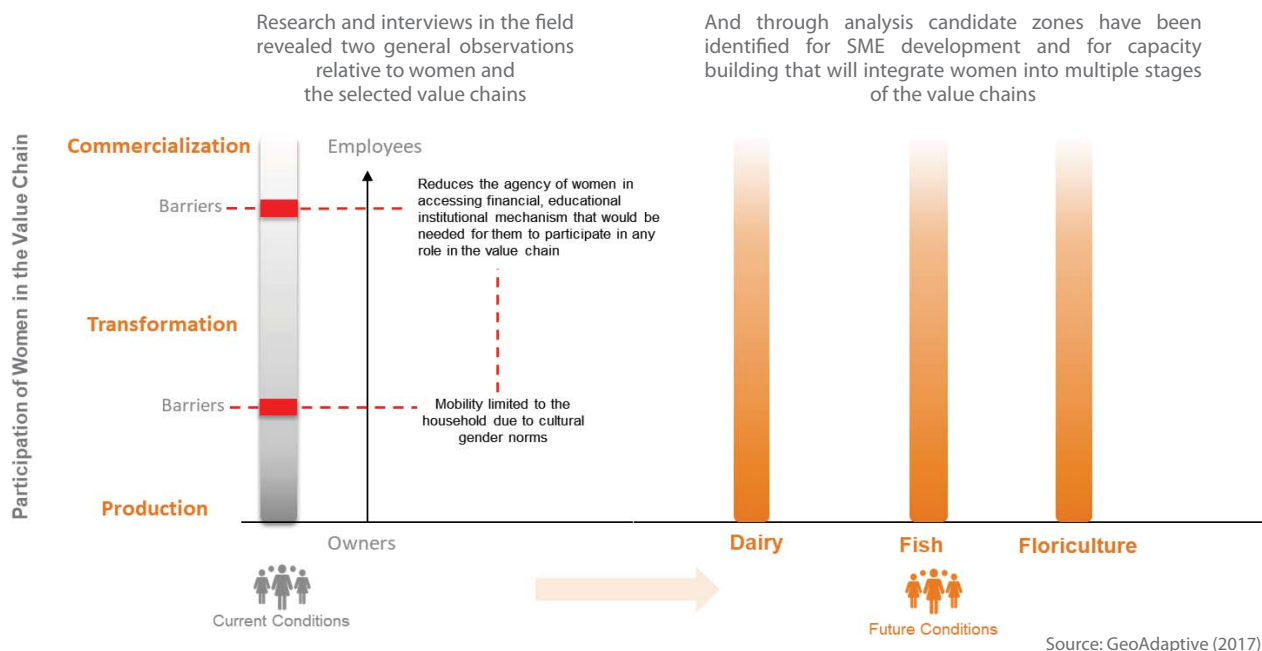


Figure 73. The impacts of limited mobility on the ability of women entrepreneurs to access financial and education support services

# Dairy

## Potential Infrastructure and Capacity Building to Improve Wholesale Collection and Marketing of the Dairy Value Chain

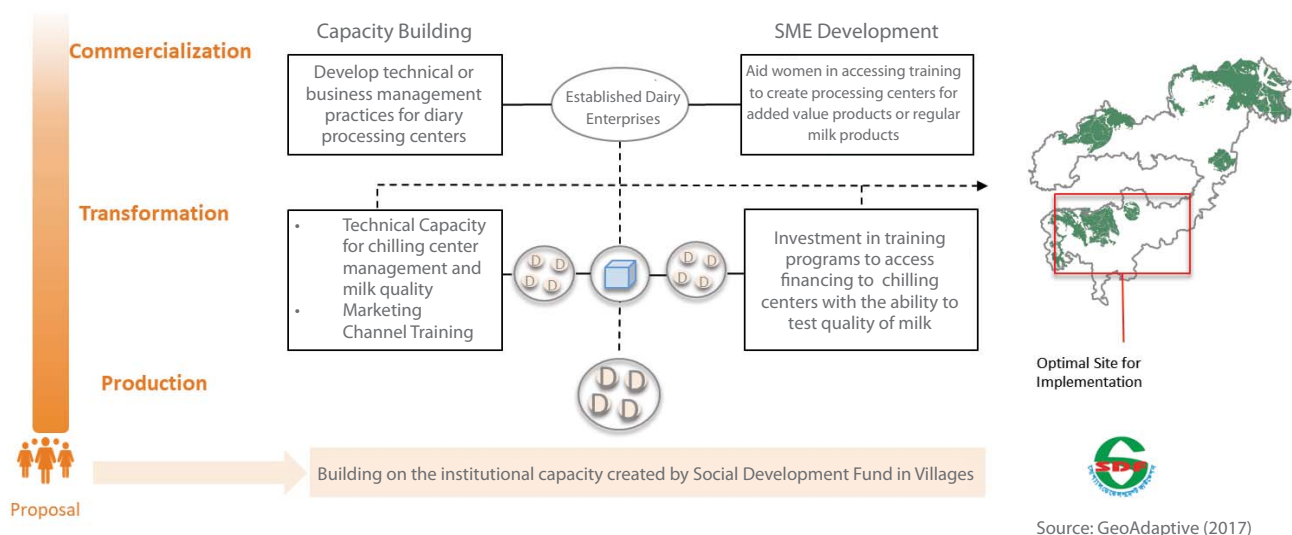


Figure 74. Improving the vertical intergration of women-driven SMEs into the dairy value chain.

### Improving Access to the Dairy Value Chain

The dairy value chain in Bangladesh is tailored to meet the demand of rural and decentralized producers. Aarong Dairy, a social enterprise developed by BRAC, works by establishing a network of dairy producers that are serviced by dairy collection centers where milk is distributed to chilling center that aggregates the milk regionally. Women producers are paid from daily deliveries that measure the fat content and overall quality of the milk.

This approach has been successful in large part due to the decentralized nature of the milk collections, which allows women to stay close to their households or villages. In villages where the SDF has activated Nuton Jibon Livelihood Improvement Programs and women have been organized into producer groups that are

provided feed and veterinary support services, there is an opportunity to promote new women-driven SMEs in the dairy value chain that link with the demands of social enterprises such as BRAC or other private sector dairy stakeholders.

The study has identified milk collection centers as being an enterprise that could provide new employment and ownership roles for the dairy value chain. Through investment that improves the technical capacity of producer groups as well as their SME business acumen, these collection centers can help integrate women entrepreneurs into new stages of the value chain.

# Floriculture

## Potential Infrastructure and Capacity Building to Improve Wholesale Collection and Marketing of the Floriculture Value Chain

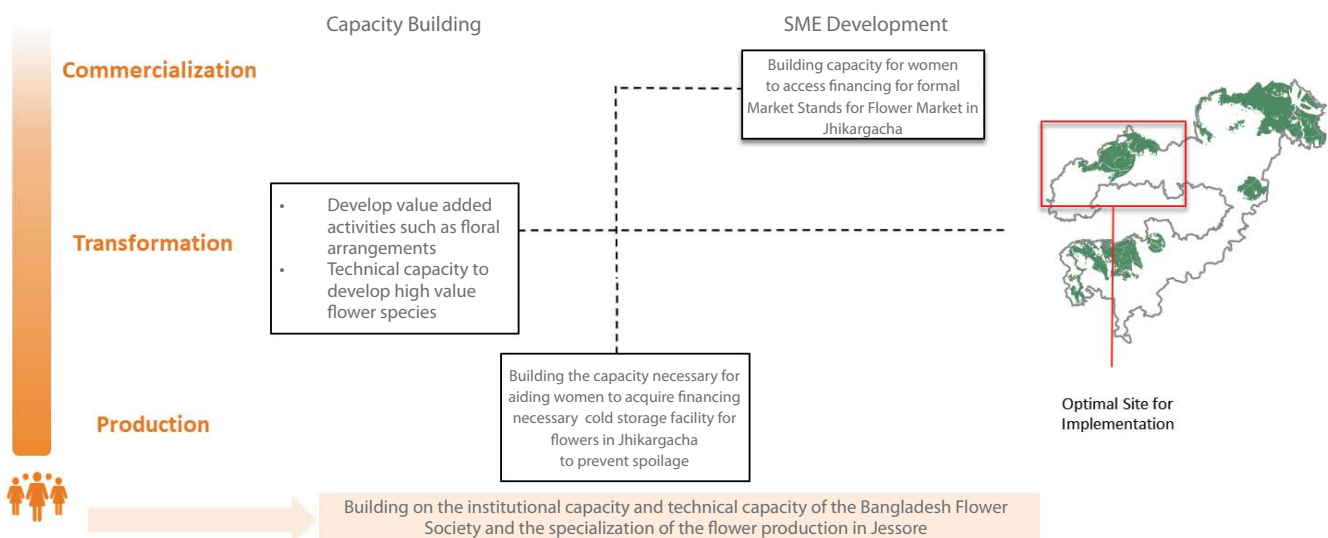


Figure 75. Improving the vertical intergration of women-driven SMEs into the value chain of floriculture

### Improving Access to the Floriculture Value Chain

The floriculture value chain in southwestern Bangladesh is unique to the region, and Jessore produces the largest quantity of flowers in the country. Women in the flower-producing region known as Jhikargacha are highly involved in the production of flowers. The women involved with this value chain have strong technical knowledge on the flower production, especially in the production of rose and gerberas. However, the women in the sector struggle with asymmetrical pricing information with wholesalers as well as being constrained to sell their product quickly due to the rapid deterioration of cut flower goods.

Flower producer groups need the necessary capacity development so that they can grow higher-value flower species. In addition, the training programs could help develop the technical capacity for producer groups to create flower arrangements. Lastly, given the lack of cold storage facilities, producer groups could use technical knowhow to grow tropical flowers that do not require cold storage.

On the SME development side, women-driven producer groups also need guidance as they establish themselves legally and acquire the necessary footing to acquire financial loans for the establishment of cold storage facilities for their products in order to manage inventory and reduce the pressure to sell quickly to wholesalers.



# Fisheries



## Potential Infrastructure and Capacity Building to Improve Wholesale Collection and Marketing of the Dry Fish Value Chain

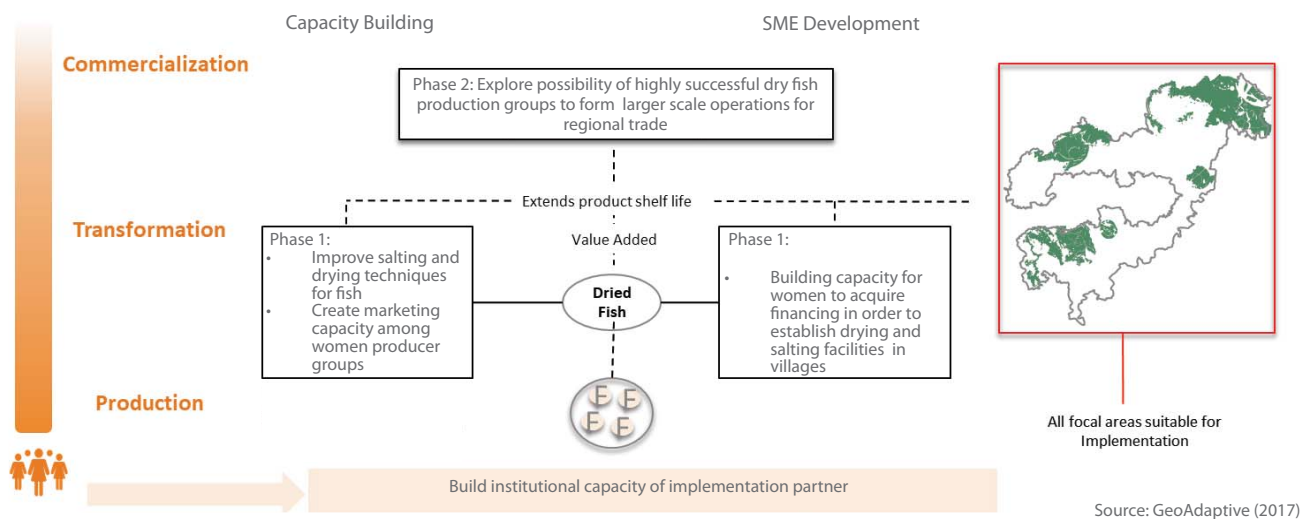


Figure 76. Improving the vertical intergration of women-driven SMEs into the value chain of fisheries

### Improving Access to the Fishery Value Chain

The fishery value chain in southwestern Bangladesh is characterized by multiple stakeholders who breed eggs and raise fingerlings to maturity to sell in the market. Women in this value chain partake in the portion of the value chain that involves raising the fingerlings to maturity. In this stage of the value chain, producers do not partake in any value addition activities.

Recognizing the domestic and worldwide need for dried fish, women producer groups need to be linked with private sector actors involved in the transformation and commercialization stages of the dried fish value chain. Producer groups need the technical and business knowhow to establish and manage drying and salting facilities for fish.

This would be a good way to integrate women-driven SMEs into the value chain given the limited mobility of women in rural southwestern Bangladesh and the limited market interactions that they currently have in selling fish. This could provide a new role for women in the value chain, while also providing value addition opportunities for women.

# From Site Visits to Validation with Stakeholders

The study results were presented and discussed at a workshop organized by The World Bank Group on November 8th, 2017 in Dhaka.

Thirty-three different stakeholders participated, provided their inputs and contributions to validate the recommendations.

## Purpose of the Workshop

### 1. Dairy

To identify different barriers and conditions for women to have a stronger and more inclusive participation in the value chain

### 2. Fisheries

To identify potential solutions based on the current challenges and identification of stakeholders who can support these solutions

### 3. Floriculture

To explore the challenges and opportunities faced by stakeholders in the value chain. Greater emphasis was placed on discussing the challenges faced by producers in the value chain, given that women are highly represented in the value chain as producers

### 4. Enabling Environment for Women Entrepreneurs

To create an enabling environment for women traders to enter and succeed in the regional export market, identifying priorities that need to be addressed by: 1) government, 2) private sector, and 3) NGOs at national, division, and local levels

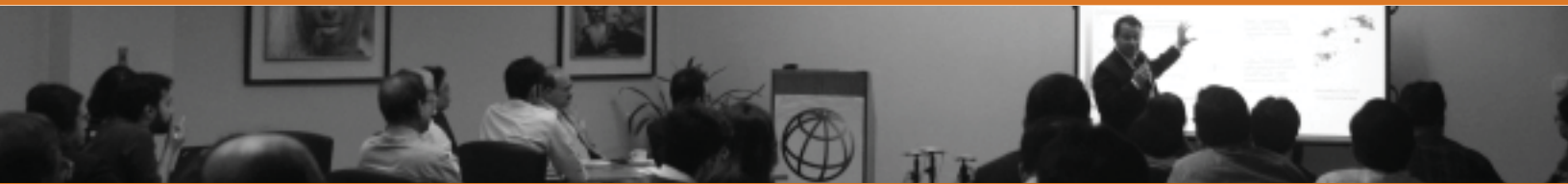


Figure 77 Site visit in Satkhira and discussion with women entrepreneurs in dairy



Source: GeoAdaptive (2017)

Figure 78. Connecting and the Dots: Weaving the Web of Analytics around Gender and Trade workshop on November 8th, 2017 at World Bank Dhaka



## Challenges and Potential Solutions

### 1. Dairy

Challenges	Potential Solutions
<ul style="list-style-type: none"> <li>• Women entrepreneurs in dairy require additional support systems to alleviate workload associated with family and childcare. Cooperative village-level childcare program would be needed</li> <li>• Programs to create social and family awareness of the potential roles women can have in the family finances and community development</li> <li>• Organization training beyond the entrepreneur level is necessary to create a robust investment and business environment</li> </ul>	<ul style="list-style-type: none"> <li>• Integrating women into technical training</li> <li>• Need for specialized SME on dairy collection</li> <li>• Risk/Mitigation Insurance</li> <li>• Insurance negotiation through a trade organization</li> <li>• Individual animal insurance through partner/agent model</li> <li>• Refinancing Schemes (example)               <ul style="list-style-type: none"> <li>• 5% Interest</li> <li>• No Collateral</li> <li>• 54 Months to Re-pay</li> <li>• 14 Month Grace Period</li> </ul> </li> <li>• Finance through Producer Groups</li> <li>• Training for Financial Access</li> </ul>

### 2 Fisheries

Challenges	Potential Solutions
<ul style="list-style-type: none"> <li>• Women lack access to specialized service providers who can share new methods and industry-specific research</li> <li>• Women lack access to R&amp;D services for the industry</li> <li>• Women lack critical resources</li> <li>• Social change requires time</li> </ul>	<ul style="list-style-type: none"> <li>• Government Support Services, such as a childcare center, would allow women to take time for SME training</li> <li>• Multi-platform training and education initiatives for women</li> <li>• Support services for women should be modeled on the idea that if women cannot travel to receive services, than the services should come to them</li> <li>• Discuss with women entrepreneurs their lack of presence in the fishery sector</li> <li>• Need government R &amp; D efforts to create the type of products in dry fisheries that export markets such as South Korea might be interested in and to understand the quality standards that are required</li> <li>• Craft innovative ideas about how to get the market to women entrepreneurs, given their limitations in accessing markets the traditional way.</li> </ul>

In addition to the solutions, stakeholders provided a list of potential implementation partners for fishery products:

- |                         |                                       |                                       |
|-------------------------|---------------------------------------|---------------------------------------|
| • CARE                  | • Yunus Center                        | • Matsya (Grameen Fishery Foundation) |
| • WorldFish             | • Social Development Foundation (SDF) | • University partnership:             |
| • Department of Fishery | • Women Entrepreneurs Association     | • Mymensingh                          |
|                         |                                       | • Khulna University                   |

### 3. Floriculture

Challenges	Potential Solutions
<ul style="list-style-type: none"> <li>• Male dominated society</li> <li>• Males disinterested in initial stages of the value chain.</li> <li>• Age of marriage is &lt; 20. Women lose interest in the in being entrepreneurs</li> <li>• Women afraid of walking at night</li> </ul>	<ul style="list-style-type: none"> <li>• Technical training needed to improve business acumen such as marketing and managing people</li> <li>• Learning programs for both women and men to recognize the value of women in the household</li> <li>• Recognize that strategies are going to be different for women producers as opposed to women entrepreneurs</li> <li>• Access to information</li> <li>• Government monitoring and oversight               <ul style="list-style-type: none"> <li>• Implementation of flower standards</li> </ul> </li> <li>• Making inputs more widely available</li> <li>• Develop nurseries</li> <li>• R&amp;D in floriculture sector</li> <li>• Export market research</li> </ul>

In addition to the solutions, stakeholders provided a list of potential implementation partners for flower products:

- Department of Agricultural Extension
- Bangladesh Flower Society
- Joint venture program with other countries
- Research institution/university: R &D for value added products related to flowers

### 4. Enabling Environment for Women Entrepreneurs

Solutions
<ul style="list-style-type: none"> <li>• Women's access to information must be facilitated:           <ul style="list-style-type: none"> <li>• At district level, the private sector chambers can play a role in providing women information on relevant rules and regulations to get trade licenses, import/export licenses, TIN numbers, information on export markets. Chambers could set up help desks</li> <li>• The Government A2I project can be accessed and it should be examined whether they can provide trade and entrepreneurship related information to the local government bodies: city corporations, municipalities, and even the union information centres</li> <li>• The Ministry of Commerce is developing a trade portal which will include regional trade data</li> <li>• Ministry of Industry is doing a GI listing of products. This information can be made available to women entrepreneurs and exporters</li> </ul> </li> <li>• Women's access to finance should be facilitated:           <ul style="list-style-type: none"> <li>• Training needs to be given to banks about women's entrepreneurship, the sectors they work in, and their needs and priorities. Banks need to develop skills to deal with women clients</li> <li>• Women entrepreneurs need training, orientation and assistance in dealing with banks: how to present their case, what documents are required, what are the terms and conditions of banks, how bank loans should be handled, etc.</li> <li>• The national policies and Central Bank initiatives providing special finances for women entrepreneurs need to be monitored and followed up to ensure proper implementation</li> </ul> </li> <li>• Capacity building is required at various levels for various groups:           <ul style="list-style-type: none"> <li>• Entrepreneurs need capacity building on business start-up and export procedures. Women Chambers are providing this support. Some GOB agencies such as SCITI and SME Foundation are doing this. Chambers can have a bigger role and are an important partner</li> <li>• Training is needed for those government officials and local government body representatives/officials who are responsible for facilitating women entrepreneurs and traders</li> <li>• Women's chambers and associations need capacity development to be able to serve their membership and carry out advocacy on trade issues with the relevant government bodies on behalf of their membership</li> </ul> </li> <li>• Trade policies should be reviewed and revised:           <ul style="list-style-type: none"> <li>• More women's associations should be involved as well as women from trade associations and chambers</li> </ul> </li> <li>• Women entrepreneurs can be provided support through a cluster approach. This will help them deal with marketing, exports and negotiations with various groups</li> <li>• Women exporter/traders could be encouraged by through an annual awards program</li> </ul>

# Annexes

---

- A. Field Visit Insights
- B. Technical Details
- C. Data Catalog- Geospatial
- D. Data Catalog- Trade Export
- E. References

# Annex A. Field Visit Insights

## Mission Objectives:

- Acquire first-hand experience in the AOI
- Explore critical links in the value chain (e.g. collection, processing and commercialization points) across prioritized areas of the AOI for identified products
- Meet with key stakeholders to validate research and products
- Conduct discussions with stakeholders about the potential to develop women-driven SMEs for identified products, and
- Acquire key government datasets that underpin the formulation and refining of the research on products selected for further analysis



Observing production and processing of floriculture



Gathering insight from small dairy producers that work with Aaron Dairy



Talking to women entrepreneurs working in fisheries and raising fingerlings

Visiting a Nuton Jibon Village

Talking with SDF Regional Office Officials

Source: GeoAdaptive (2017)

### Lessons Learned from Mission and Local Stakeholders:

Nuton Jibon/ Social Development Foundation (SDF)	
Meeting Location(s)	Discussion at Dhaka Field Visit- Jessore, Satkhira, and Khulna
Meeting with	Social Development Foundation (SDF)
Objectives	<ul style="list-style-type: none"> <li>Learn about the success of Notun Jibon project in rural communities in Bangladesh</li> <li>Visit rural beneficiary communities in Jessore and Satkhira to learn about the short- and long-term needs for women-driven SMEs</li> <li>Collect insights and data about the type of capacity building programs developed through Nuton Jibon project</li> </ul>
Lessons learned:	<ul style="list-style-type: none"> <li>A beneficiary village the team visited in Satkhira conducts a bi-weekly meeting to: 1) check-on yields and revenues of the products (e.g. dairy), 2) identify needs of construction and maintenance of the infrastructure in the community, and 3) provide and train women on access to finance.</li> <li>Women are major labor forces in the community, contributing in production of agricultural crops and dairy; while men are involved in processing and selling products.</li> <li>Women who focus on homestead dairy farming have expressed interest in receiving training to understand how cow feed and vaccination relates to high yields</li> </ul>

BRAC	
Meeting Location(s)	Discussion at Dhaka Field Visit- Satkhira
Meeting with	BRAC Dairy
Objectives	<ul style="list-style-type: none"> <li>Collect location of chilling centers and BRAC programs that benefited women at national level and in southwestern region of Bangladesh</li> <li>Visit rural beneficiary communities in Satkhira, especially those have milk chilling and processing centers, and meet women producers</li> </ul>
Lessons learned:	<ul style="list-style-type: none"> <li>About 3,000 households in Satkhira are producing milk and about 10,000 cattle (6,000 cows) contribute to milk production</li> <li>There are 8 milk collection centers; and 7 collection points across Satkhira (Figure A.3). Milk collection center technicians perform quality control of the product</li> <li>About 12,000 liters of qualified milk are produced and collected from both collection centers and points; then reported to BRAC dairy</li> </ul>

### Lessons Learned from Mission and Local Stakeholders:

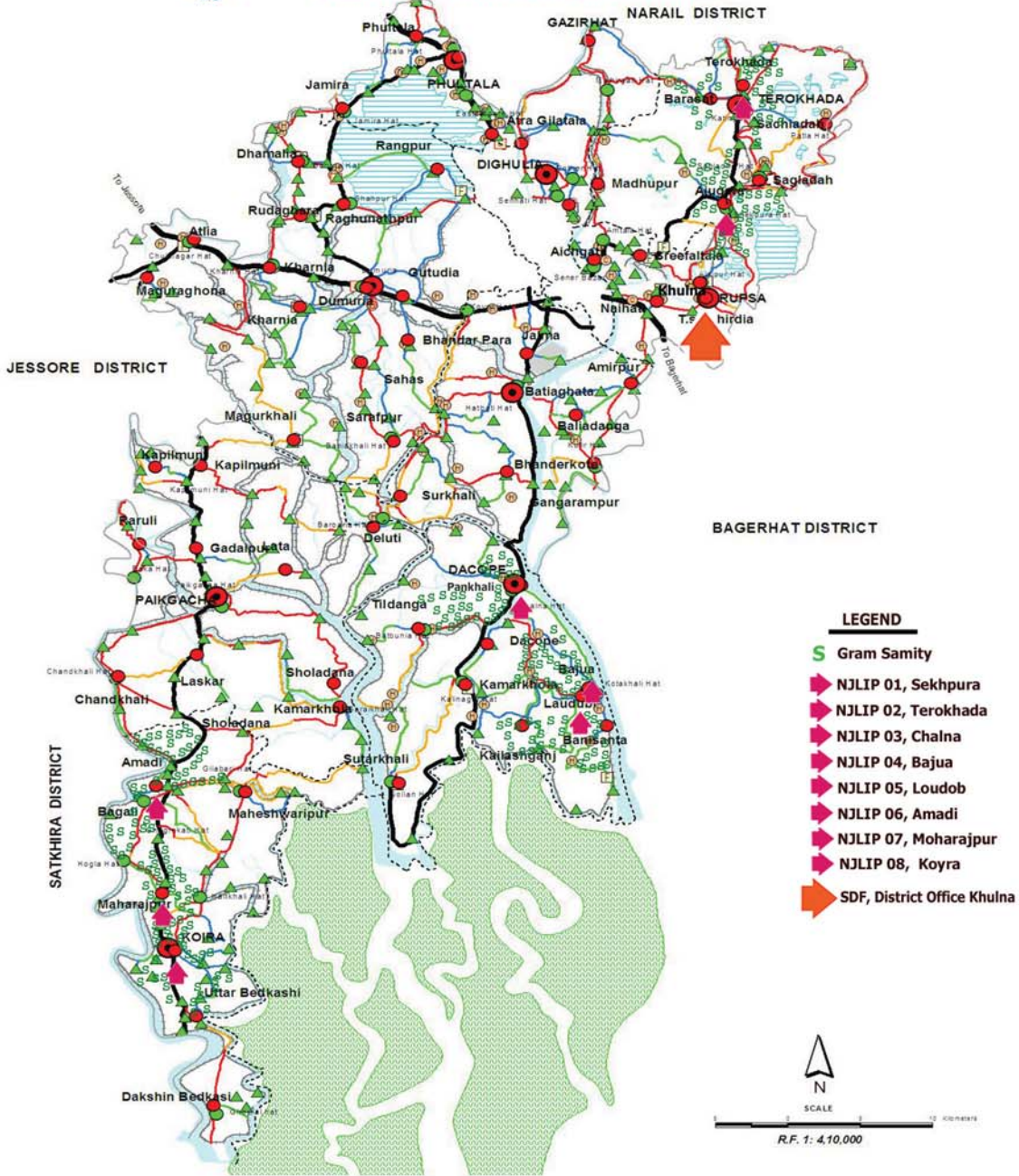
World Fish Bangladesh Frozen Foods Exporters Association (BFFEA) & Department of Fishery Atlas Sea Food Industry Ltd.	
Meeting Location (s)	Field Visit- Jessore, and Khulna
Meeting with:	<ul style="list-style-type: none"> <li>WorldFish</li> <li>Department of Fishery, Khulna</li> <li>Bangladesh Frozen Foods Exporters Association (BFFEA)</li> </ul>
Objectives	<ul style="list-style-type: none"> <li>Observe fishery production, including SMEs business owners- 1) fingerling, 2) carp hatchery, 3) tilapia fry production system and brood rearing, and 4) a women entrepreneur</li> <li>Hear experience of BFFEA and Department of Fishery on existing production/processing system and status of the export</li> </ul>
Lessons learned:	<ul style="list-style-type: none"> <li>In order to reduce poverty, USAID started the Aquaculture for Income and Nutrition (AIN) program that was implemented by WorldFish. The main objective is to emphasize technology development for improved fish strains, and capacity building in hatcheries and nurseries for wider dissemination and uptake among small and medium scale household and commercial producers</li> <li>The program covers 68 Upazilas in four (4) zilas- Khulna, Jessore, Faridpor, Barisal, and Chittagong, and the main location is Khulna</li> <li>From AIN, high quality and accessible seed is identified as the most important factor for sustainable production in aquaculture</li> <li>Fishery industry is maintained using various types of productions, including feed mills, ice plants, hatcheries, and culturing</li> <li>Shrimp culture is of central importance to the fishery sector in Bangladesh particularly in the context of export earnings- it also provides direct employment to over 1 million people who, in turn, support well over 3.5 million dependents</li> <li>Major export destinations are Belgium, UK, and Netherlands by order in FY 2014-15</li> <li>Among fish, Pangasius is available in all major rivers of the middle and southern parts of the country</li> </ul>

Bangladesh Flower Society (BFS)	
Meeting Location (s)	Field visit- Jessore (Godkhila)
Meeting with:	<ul style="list-style-type: none"> <li>The Bangladesh Flower Society (BFS)</li> <li>About 30 women floriculture producers in Godkhila</li> </ul>
Objectives	<ul style="list-style-type: none"> <li>Visit the largest floriculture production location across the country and to understand the floriculture process to a value-added product</li> <li>Meet women floriculture producers to understand their constraints</li> </ul>
Lessons learned:	<ul style="list-style-type: none"> <li>While floriculture in Bangladesh is in an early stage; about 50,000 MT lands are used for floriculture production</li> <li>Roses are the main production in floriculture in Godkhila; and demand has increased in the inland markets and internally such as to India</li> <li>Women are involved in all three phases of value chain, however, the general market chain is operated through middle men</li> <li>Financial and technical support for flower production is still limited but comes from different government, agencies, NGOs, and private banks</li> </ul>





**Social Development Foundation (SDF)**  
**Khulna Region**  
**NJLIP Project Intervend Area, Khulna District**



LEGEND				
<b>Administrative Boundaries</b>	<b>Physical Infrastructures</b>	<b>Socio-Economic Infrastructures</b>	<b>Natural Features</b>	<b>Agricultural Infrastructures</b>
<ul style="list-style-type: none"> <li>International Boundary</li> <li>District Boundary</li> <li>Upazila Boundary</li> <li>Union Boundary</li> <li>Municipal Boundary</li> </ul>	<ul style="list-style-type: none"> <li>National Highways</li> <li>Regional Highways</li> <li>Zila Road</li> <li>Upazila Road (Pucca)</li> <li>Upazila Road (Katcha)</li> <li>Union Road (Pucca)</li> <li>Union Road (Katcha)</li> <li>Railway Network</li> </ul>	<ul style="list-style-type: none"> <li>Growth Centre</li> <li>Rural Market</li> <li>Police Station</li> <li>Upazila Health Complex</li> <li>Family Welfare Centre</li> <li>Post Office</li> <li>College</li> <li>High School</li> </ul>	<ul style="list-style-type: none"> <li>Wide River with Sandy Area</li> <li>Khal / Small River</li> <li>Water Bodies</li> <li>Forest Area</li> <li>Hill Area</li> </ul>	<ul style="list-style-type: none"> <li>Embankment</li> </ul>
<b>Administrative HQs</b>				
<ul style="list-style-type: none"> <li>District HQ</li> <li>Upazila HQ</li> <li>Union HQ</li> </ul>				
<small>Compiled from : SPOT Image 1985-90, Aerial Photograph 1983-84, Topographic Maps, Thana Maps, B.B.S and Field Checking.            Projection : Lambert's Conformal Conic            Data Source : GPS Field Survey 1999            PREPARED BY : GIS UNIT  <b>LOCAL GOVERNMENT ENGINEERING DEPARTMENT</b></small>				

Figure A. 1. NJLIP beneficiary communities in Khulna shared by SDF. The location has been geocoded by GeoAdaptive



# Social Development Foundation (SDF)

Khulna Region

NJLIP Project Intervend Area, Satkhira District

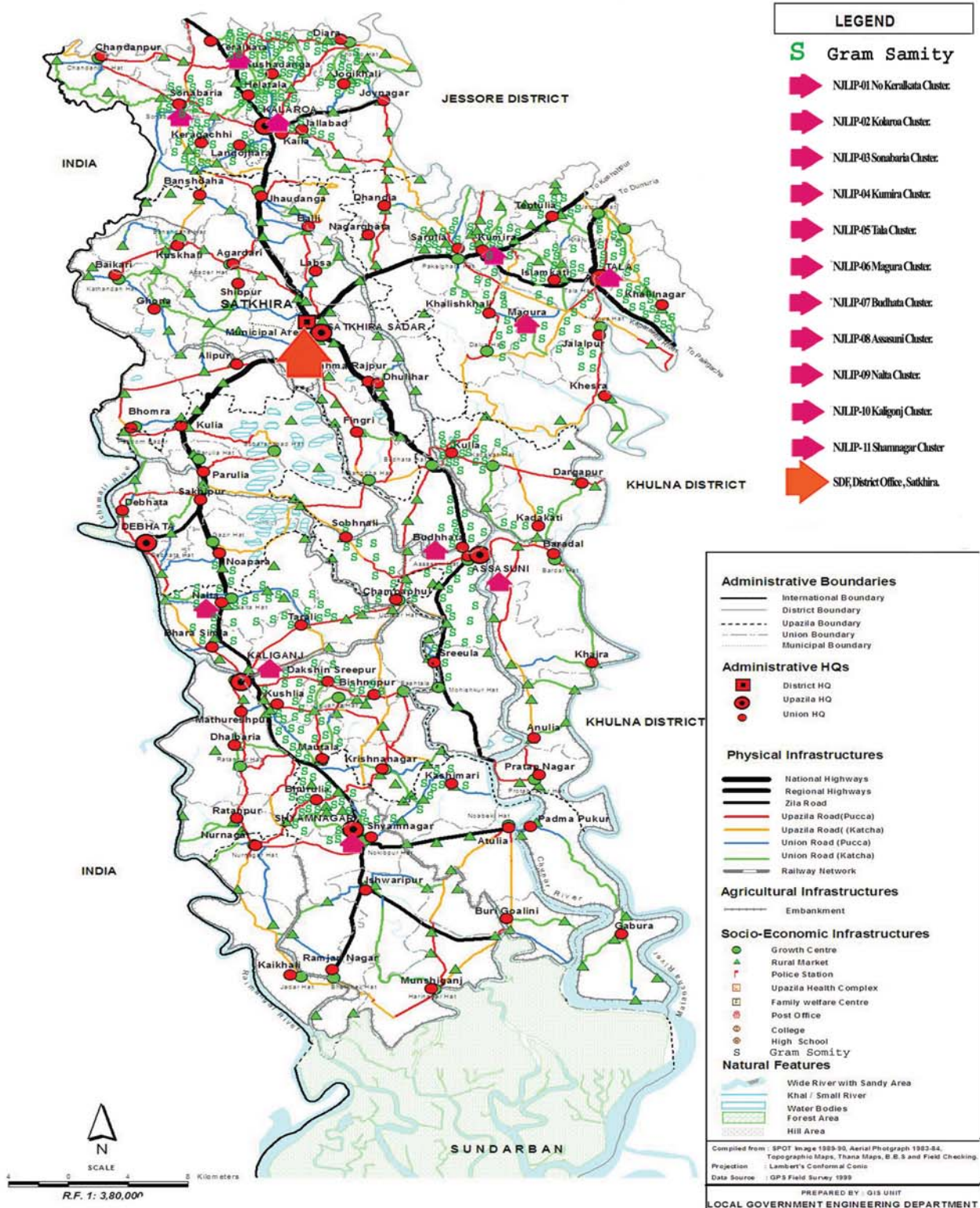


Figure A. 2. NJLIP beneficiary communities in Satkhira shared by SDF. The location has been geocoded by GeoAdaptive

# DISTRICT MAP OF SATKHIRA DISTRICT KHULNA DIVISION

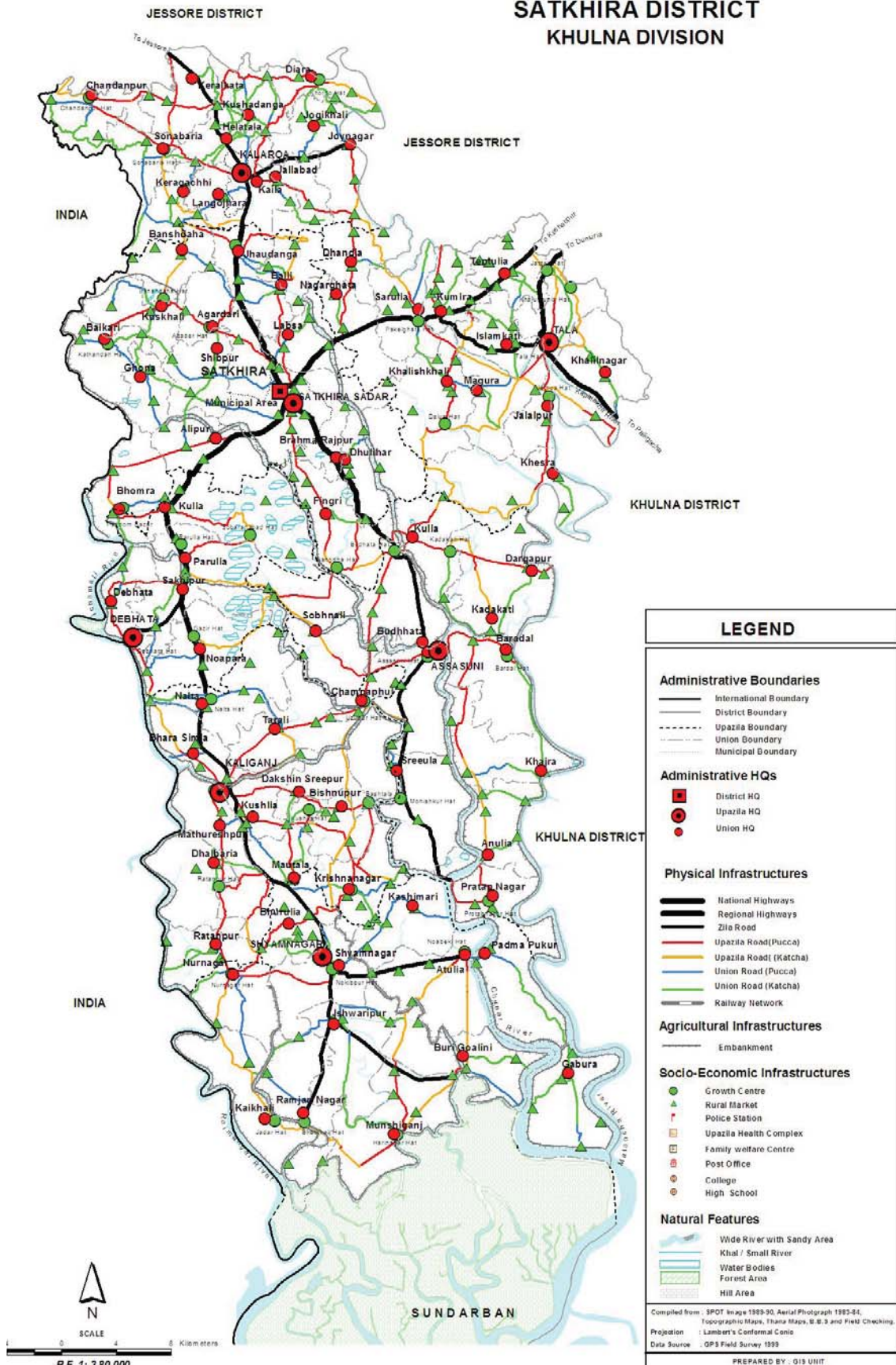


Figure A. 3. Location of milk collecting centers and points in Satkhira by BRAC. The location has been geocoded by GeoAdaptive

# Annex B. Technical Details

## Chapter 2. Sociodemographic and Labor Force Analysis

### Geospatial Profiling

#### 1. Demographics

##### Data:

- Total number of population per Upazila, Bangladesh Bureau of Statistics (BBS), 2001 and 2011
- World Pop population projection for 2015
- Total number of male/female population per Upazila, BBS 2011
- Total number of population by age breakdown per Upazila, BBS 2011

##### Limitation:

- Numbers for population data were based on the official census data from BBS; however, it may not reflect the growth and migration patterns as of 2017, when the study was conducted.

#### 2. Infrastructure

##### Data:

- Road network, Bangladesh Local Government Engineering Department (LGED) 2014
- Public transportation infrastructure- bus station, transit hub, railway, Open Street Map (OSM) 2016
- Power plants & electricity line, The National renewable Energy Laboratory (NREL) 2007 and 2013

##### Limitation:

- Road segments were based on the official data from LGED; however, may not reflect current conditions as of 2017, when the study was conducted
- Road segments do not represent seasonal conditions
- Speed limit for road segments (by road type) were not available; the analytical team estimated approximate speed limit using real-time traffic
- Data for electricity were based on the official data from NREL; however, they may not reflect current conditions in Bangladesh
- The location of public transportation infrastructure was from an open data source

#### 3. Social Conditions

##### Data:

- Total number of population without any education per Upazila, BBS 2011
- Location of education centers, LGED 2017
- Location of health centers, LGED 2017
- Total number of literate population (age over 15) per Upazila, BBS 2011

##### Limitation:

- Numbers for population regarding education and literacy were acquired from the official census data from BBS; however, it may not reflect the growth and migration patterns as of 2017, when the study was conducted.
- Access to health centers is calculated based on the travel time using network analysis created by GeoAdaptive. The travel time method incorporates information of road networks in Bangladesh, specifically the estimated travel speed for each type of road. The analysis assumed the following speed of road: 1) national highway- 60Kmph, 2) regional highway- 50kmph, 3) Zila road- 30kmph, 4) Upzila, Union, and Village A and B road- 20kmph. The calculations were based on the assumption of using a private vehicle; and did not consider other factors that may delay the trip.

#### 4. Economic Conditions

##### Data:

- Income (1km grid), Worldpop 2017
- Total number of population economically active per Upazila, BBS 2011
- Total number of population economically active by sector per Upazila: 1) agriculture, 2) industry, and 3) service, BBS 2011
- Total number of SMEs per Upazila, BBS 2011

##### Limitation:

- Because no official data for income was published, the analytical team used income data estimated by Bayesian model geostatistics. The results are from a combination of grid-based spatial covariates and aggregated mobile phone data, applied to mobile tower household survey data on income from Grameenphone Ltd. Method is referred from Steele, J. E., Sundsoy, P. R., Pezzulo, C., Alegana, V. A., Bird, T. J., Blumenstock, J., & Hadiuzzaman, K. N. (2017). Mapping poverty using mobile phone and satellite data. *Journal of The Royal Society Interface*, 14(127), 20160690.
- Numbers for population regarding economic activities were acquired from the official census data from BBS; however, may not reflect the growth and migration patterns as of 2017, when the study was conducted.
- Numbers of SMEs per Upazila was acquired from the official census data from BBS; however, it may not capture current establishment of enterprises as of 2017, when the study was conducted.

#### 5. Women-driven Socioeconomic Conditions

##### Data:

- Total number of females employed per Upazila, BBS 2011
- Total number of females that have attained: 1) primary, 2) secondary (SSC, HSC), and 3) tertiary education per Upazila, BBS 2011

##### Limitation:

- Numbers for the female population regarding their socioeconomic conditions were acquired from the official census data from BBS; however, it may not reflect the growth and migration patterns as of 2017, when the study was conducted

#### Multisectoral Assessment

After understanding five (demographics, infrastructure, social and economic conditions, and women-driven socioeconomic conditions) geospatial patterns of the study region, 19 indicators were selected to identify areas of opportunity for establishing women-driven enterprises. A threshold for each indicator was identified (Table 7). These thresholds are referred from literature and statistical methods to evaluate areas of opportunity and constraints in binary. By overlapping 19 opportunity areas, this approach enabled the creation of a customized index, representing multisectoral conditions of opportunity to establish women-driven enterprises in the study region

##### Limitation:

- All variables for the index are equally weighted, which may prevent the identification of the critical conditions needed to establish women-driven SMEs in the AOI

---

# Annex B. Technical Details (Continued)

---

## Chapter 3. Spatial Economic Structure Analysis

### Calculate Travel Time

Two steps of the analysis were conducted to assess geographical routes of the value chain as explained below:

1. Create a territorial surface that represents travel cost by 100m grid- Rather than only considering characteristics of road, this method applied variables, influencing impedances of the trip such as: 1) slope based on the elevation, 2) characteristics of the road segments (e.g. length and speed restriction, and 3) characteristics of the land (e.g. land cover and zoning).
2. Calculate travel time to the destination- Using the territorial surface created, this method determines the shortest weighted distance from each grid to the nearest destination.

Using the territorial surface to calculate travel time provided an advantage to increase accuracy of the trip because it was not restricted by an administrative boundary. However, the analysis may have limitations with respect to:

- Indicating the feasibility of non-transportation environmental seasonality (e.g. monsoon)
- Estimating the accessibility cost of travel time in driving a personal vehicle
- Current conditions of road segments were based on the official data from LGED

This page is intentionally left blank

## Annex C. Data Catalog- Geospatial

#	Category	Sub-catagory	Data Description	Source	Year	Data Type
1	ADMINISTRATION BOUNDARY	Boundary	national	DAGM	2016	Geodata
			Division	DAGM	2016	Geodata
			District (Zila)	DAGM	2016	Geodata
			Area of Interest (AOI)- 26 Upazila	GeoAdaptive	2017	Geodata
			Upazila	DAGM	2016	Geodata
			Union	World Food Program (WFP)	2014	Geodata
			Major town	LGED	2016	Geodata
2	DEMOGRAPHICS	Population	Total population	BBS	2011	Geodata, tabular
			Total household	BBS	2011	Geodata, tabular
			Urban/rural population	BBS	2011	Geodata, tabular
			Population density	GeoAdaptive	2017	Geodata, tabular
			Population density for year 2010, 2015, and 2020 (projection)	World Pop	2015	Geodata
			Gender	BBS	2011	Geodata, tabular
			Age breakdown	BBS	2011	Geodata, tabular
		Socioeconomic Status	Education level (attainment)	BBS	2011	Geodata, tabular
			Literacy rate	BBS	2011	Geodata, tabular
			Average household Income (USD)	WorldPop/DHS	2013	Geodata
			Extreme poverty	BBS	2011	Geodata, tabular
			Population without sanitation	BBS	2011	Geodata, tabular
			Population without electricity	BBS	2011	Geodata, tabular
			Employment rate	BBS	2011	Geodata, tabular
		Health	Employment rate by sector: 1) agriculture, 2) industry, and 3) service	BBS	2011	Geodata, tabular
			Pregnancy	WorldPop/DHS	2015	Geodata
		SME	Birth rate	WorldPop/DHS	2015	Geodata
			SME establishments	BBS	2011	Geodata, tabular
			SME population engaged	BBS	2011	Geodata, tabular



#	Category	Sub-catagory	Data Description	Source	Year	Data Type
2	DEMOGRAPHICS	Female-Focused	Female without sanitation	BBS	2011	Geodata, tabular
			Female without electricity	BBS	2011	Geodata, tabular
			Female literacy rate	BBS	2011	Geodata, tabular
			Female vocational education attainment	BBS	2011	Geodata, tabular
			Female education attained (primary, junior, seondary, SSC, HSC, Degree, and higher degree)	BBS	2011	Geodata, tabular
			Female economic activity (employment)	BBS	2011	Geodata, tabular
3	NATURAL ENVIRONMENT	Environment	Major river	Bangladesh Agricultural Resource Council	Unknown	Geodata
			Waterbody (polygon and line)	NREL	2013	Geodata
			DEM/Slope	CIS CIGAR	2013	Geodata
			Sundarban area	Bangladesh Agricultural Resource Council	Unknown	Geodata
			Soil salinity		Unknown	Geodata
		Hazard	Flood prone areas	Darthmouth Flood Observatory	2013	Geodata
			Ecological constrained area	Bangladesh Agricultural Resource Council	Unknown	Geodata
			Hazard frequency		Unknown	Geodata
			Flood hazard		Unknown	Geodata
			4	INFRASTRUCTURE	Transportation	Airport
Land ports	OSM	2016				Geodata
Bridge	OSM	2016				Geodata
Railroad	NREL	2007				Geodata
Road network	LGED	2013				Geodata
Public transit station/bus stops	LGED	2014				Geodata
Electricity	Power plant	NREL			2013	Geodata
	Electricity transmission line	NREL			2017	Geodata
5	SERVICE	Health	Hospital location	LGED	2013	Geodata, tabular
			Family care center location	LGED	2013	Geodata, tabular
		Education	Education facility location	LGED	2013	Geodata
		Food	Bakery	OSM	2016	Geodata
			Convenience store	OSM	2016	Geodata
			Green grocery	OSM	2016	Geodata
			Supermarket	OSM	2016	Geodata
			restaurant	OSM	2016	Geodata

## Annex D. Data Catalog- Trade Export Data

Source of Products	Food Group	Products	Products Exported by Bangladesh and Classified According to the Harmonized Commodity Description and Coding System (HS)	
SME Agglomeration Analysis	Processed Fish			
	Not specified		Live fish HS CODE: 0301	
			Fish, fresh or chilled (excluding fish fillets and other fish meat of heading 0304) HS CODE: 0302	
			Frozen fish (excluding fish fillets and other fish meat of heading 0304) HS CODE: 0303	
			Fish fillets and other fish meat, whether or not minced, fresh, chilled or frozen HS CODE: 0304	
		Fish, fit for human consumption, dried, salted or in brine; smoked fish, fit for human consumption, ... HS CODE: 0305		
Products in which a Zila in the AOI is a top 10% national producer	Major Grains	Wheat	Wheat and Meslin	
	Pulses	Gram	Dried, shelled chickpeas "garbanzos", whether or not skinned or split	
		Pea (Motor)		Fresh or chilled peas "pisum sativum", shelled or unshelled
				Dried, shelled peas "pisum sativum", whether or not skinned or split
				Peas "Pisum Sativum", prepared or preserved otherwise than by vinegar or acetic acid (excluding frozen)
				Shelled or unshelled peas "Pisum sativum", uncooked or cooked by steaming or by boiling in water, frozen
			Flour, meal and powder of peas, beans, lentils and the other dried leguminous vegetables of heading 0713	
		Lentil (Masur)	Dried, shelled lentils, whether or not skinned or split	
	Oil Seeds	Sesame(Till)		Sesamum seeds, whether or not broken
				Sesame oil and its fractions, whether or not refined, but not chemically modified

Quantitative Criteria									
Product Competitiveness		Bangladesh International Trade Potential				Regional Competitiveness of a Product Exported by Bangladesh		Trade with India	
World Import Market Size (USD)	World Import Value Growth Trend (% ,2012-2016)	Bangladesh Share in World Exports (%)	Bangladesh Export Value(2016)	Bangladesh Export Value Growth Trend (2012-2016)	Trade Imbalance (Exports vs. Imports) (USD Thousand)	Regional Competitiveness (Rank among South Asian Association for Regional Cooperation)	Product Market Size with India (Value, 2016)	Annual Growth in Value India Imports from the world (% ,2012-2016)	

1,886,827,000	-2	1.1	20144000	2	19896	1 out 6	0.167	0	1
18,887,900,000	6	0.1	13004000	-7	-5605	5 out 6	0.833	9697000	-12
22,352,229,000	-3	0.1	24283000	-4	14124	5 out 5	1	104000	33
22,589,032,000	1	0	1214000	-30	1021	5 out 7	0.714	0	17
5,911,386,000	0	0.1	8473000	-4	5113	4 out 6	0.667	2927000	29

36,781,508	-7	0	2,000	-82	-646,391	3 out 3	1	0	433
1,745,518,000	5	0	3,000	-67	-123,978	6 out 8	0.75	0	17
399,367,000		0	10,000	-36	-162000	3 out 6	0.5	0	
1,793,155,000	8	0	1,000	No Data	-112,769	5 out 5	1	0	16
281,833,000	-6	0	2000	-6	-22,000	2 out 4	0.5	0	-21
472,987,000	-3	0	4000	No Data	1,000	3 out 6	0.5	0	0
336,493,000	15	0	15,000	137	15,000	3 out 4	0.75	0	0
1,420,788,000	19	0	56,000	-6	-245,105	5 out 6	0.83	0	28
2,484,243,000	5	0.6		18	12,141	3 out 6	0.5	290,000	12
236,159,000	6	1.1	2,582,000	8	2,410	2 out 6	0.33	357,000	-6

Source of Products	Food Group	Products	Products Exported by Bangladesh and Classified According to the Harmonized Commodity Description and Coding System (HS)
Products in which a Zila in the AOI is a top 10% national producer	Oil Seeds	Groundnut (Rabi & Kharif)	Groundnuts, whether or not shelled or broken (excluding roasted or otherwise cooked)
			Groundnut oil and its fractions, whether or not refined, but not chemically modified
			Groundnuts, prepared or preserved (excluding preserved with sugar)
		Linseed	Linseed, whether or not broken
			Crude linseed oil
			Linseed oil and fractions thereof, whether or not refined, but not chemically modified (excluding crude)
			Oilcake and other solid residues, whether or not ground or in the form of pellets, resulting from the extraction of linseed
		Coconut	Desiccated coconuts
			Fresh coconuts in the inner shell "endocarp"
			Fresh coconuts, whether or not shelled or peeled (excluding in the inner shell "endocarp")
			Crude coconut oil
			Coconut oil and its fractions, whether or not refined, but not chemically modified (excluding crude)
			Coconut "coir" fibres, raw
			Coconut "coir" yarn
			Floor coverings of coconut fibres "coir", woven, whether or not made up
			Oilcake and other solid residues, whether or not ground or in the form of pellets, resulting from the extraction of coconut or copra

Quantitative Criteria									
Product Competitiveness		Bangladesh International Trade Potential				Regional Competitiveness of a Product Exported by Bangladesh		Trade with India	
World Import Market Size (USD)	World Import Value Growth Trend (%; 2012-2016)	Bangladesh Share in World Exports (%)	Bangladesh Export Value(2016)	Bangladesh Export Value Growth Trend (2012-2016)	Trade Imbalance (Exports vs. Imports) (USD Thousand)	Regional Competitiveness (Rank among South Asian Association for Regional Cooperation)	Product Market Size with India (Value, 2016)	Annual Growth in Value India Imports from the world (%; 2012-2016)	
3,138,046,000		0	250,000	53	-906	4 out 7	0.571	0	9
395,721,000	-2	0	0	0	-65	Not an exporter		0	-15
1,496,361,000	-2	0	26,000	65	-250	3 out 6	0.5	0	78
911,107,000	1	0	0	0	0	Not an exporter		0	No Data
84,769,000	-13	0	0	0	0	Not an exporter		0	No Data
166,849,000	-3	0	9,000	22	-28	Not an exporter		0	-15
54,989,000	-5	0	0	0	0	Not an exporter		0	-13
676,307,000	8	0	10,000	-5	-816	4 out 4	1	0	0
156,894,000	22	0	0	0		Not an Exporter		0	0
297,635,000	17	0	4,000	-4	-3,050	5 out 5	1	0	0
1422288000	3	0	3,000	0	-101	3 out 4	0.75	0	0
1511982000	6	0	12,000	149	-3,260	3 out 5	0.6	0	-5
521439000	7	0	11,000	-21	-711	4 out 5	0.8	0	5
7,228,000	-15	0	28,000	0	23	4 out 5	0.8	0	53
78,916,000	-10	0	\$1,402	0	-24	Not an exporter		0	-9
127,868,000	-14	0	0	0	-20	Not an exporter		0	57

Source of Products	Food Group	Products	Products Exported by Bangladesh and Classified According to the Harmonized Commodity Description and Coding System (HS)
Products in which a Zila in the AOI is a top 10% national producer	Spices and Condiments	Chili (Kharif)	Fresh or chilled fruits of the genus Capsicum or Pimenta
			Fruits of the genus Capsicum or of the genus Pimenta, dried, neither crushed nor ground
			Fruits of the genus Capsicum or of the genus Pimenta, crushed or ground
		Onions	Fresh or chilled onions and shallots
			Dried onions, whole, cut, sliced, broken or in powder, but not further prepared
			Vegetables, fruit, nuts and other edible parts of plants, prepared or preserved by vinegar or acetic acid (excl. cucumbers and gherkins)
		Tumeric	Turmeric "curcuma"
		Coriander (Seed)	Coriander seeds, neither crushed nor ground
			Coriander seeds, crushed or ground
		Sugar Crops	Date-Palm (Fruit)
	Fiber	Jute	Jute and other textile bast fibres, raw or processed, but not spun; tow and waste of such fibres, incl. yarn waste and garnetted stock (excluding flax, true hemp and ramie)
			Yarn of jute or of other textile bast fibres of heading 5303
			Woven fabrics of jute or of other textile bast fibres of heading 5303
			Sacks and bags, for the packing of goods, of jute or other textile bast fibres of heading 5303

Quantitative Criteria									
Product Competitiveness		Bangladesh International Trade Potential				Regional Competitiveness of a Product Exported by Bangladesh		Trade with India	
World Import Market Size (USD)	World Import Value Growth Trend (%_2012-2016)	Bangladesh Share in World Exports (%)	Bangladesh Export Value(2016)	Bangladesh Export Value Growth Trend (2012-2016)	Trade Imbalance (Exports vs. Imports) (USD Thousand)	Regional Competitiveness (Rank among South Asian Association for Regional Cooperation)	Product Market Size with India (Value, 2016)	Annual Growth in Value India Imports from the world (%_2012-2016)	
5,230,574,000	2	0.1	6,864,000	57	6,403	2 out 7	0.29	0	0
988,592,000	8	0.1	1,237,000	73	-6,928	3 out 6	0.5	0	-22
621,240,000	4	0.2	1,284,000	72	489	2 out 6	0.33	0	-10
3,225,661,000	4	0	22,000	-7	-58,092	5 out 5			
401,703,000	7	0	2,000	-42	-932	4 out 6	0.667	0	-11
1,351,317,000	2	0.1	855,000	28	703	4 out 6	0.667	11,000	-25
249,540,000	16	1	2,682,000	9	-6,252	2 out 5	0.4	0	60
177769000	18	0.1	102000	6	-722	2 out of 6	0.333	40,000	57
32,601,000	8	0.9	300000	33	296	3 out 6	0.5	0	13
1135079000	9	0	1,000	-78	-3,402	5 out 5	1	0	-78
223,748,000	0	76.4		-2	184,314	1 out 6	0.167		9
502,728,000	4	95.4		6	478,614	1 out 5	0.2	\$81,107,342	17
180,912,000	3	26.5		5	45,786	2 out 5	0.4	\$12,868,794	11
242,823,000	-12	29.5		-13	85,399	2 out 8	0.25	41,682,000	-7

Source of Products	Food Group	Products	Products Exported by Bangladesh and Classified According to the Harmonized Commodity Description and Coding System (HS)
Products in which a Zila in the AOI is a top 10% national producer	Fiber	Cotton	Cotton, neither carded nor combed
			Cotton waste, including yarn waste and garnetted stock
			Cotton, carded or combed
			Cotton sewing thread, whether or not put up for retail sale
			Cotton yarn other than sewing thread, containing $\geq 85\%$ cotton by weight (excluding that put ...
			Cotton yarn containing predominantly, but $< 85\%$ cotton by weight (excluding sewing thread and ...
			Cotton yarn put up for retail sale (excluding sewing thread)
			Woven fabrics of cotton, containing $\geq 85\%$ cotton by weight and weighing $\leq 200 \text{ g/m}^2$
			Woven fabrics of cotton, containing $\geq 85\%$ cotton by weight and weighing $> 200 \text{ g/m}^2$
			Woven fabrics of cotton, containing predominantly, but $< 85\%$ cotton by weight
	Fruit Crops	Water Melon	Fresh watermelons
		Guava	Fresh or dried guavas, mangoes and mangosteens
		Pomelo	Fresh or dried grapefruit
		Melon	Fresh melons (excluding watermelons)
Summer (Kharif) Vegetables	Pumpkin	Fresh or chilled pumpkins, squash and gourds "Cucurbita spp.	



Quantitative Criteria									
Product Competitiveness		Bangladesh International Trade Potential				Regional Competitiveness of a Product Exported by Bangladesh		Trade with India	
World Import Market Size (USD)	World Import Value Growth Trend (%; 2012-2016)	Bangladesh Share in World Exports (%)	Bangladesh Export Value(2016)	Bangladesh Export Value Growth Trend (2012-2016)	Trade Imbalance (Exports vs. Imports) (USD Thousand)	Regional Competitiveness (Rank among South Asian Association for Regional Cooperation)	Product Market Size with India (Value, 2016)	Annual Growth in Value India Imports from the world (%; 2012-2016)	
10,411,100,000	-18	0	17000	-54	-1010459	4 out 7	0.571	0	13
417,398,000	-14	1.4	6060000	-18	5345	3 out 5	0.6	3146	41
152,925,000	-11	0.2	327000	-7	-2364	2 out 5	0.4	0	2
142,201,000	-6	0.1	70000	108	-5485	4 out 5	0.8	0	-20
10,877,547,000	-4	0	692000	-35	-855553	4 out 5	0.8	1	0
1,437,810,000	-3	0	35000	-41	-105156	3 out 5	0.6	0	1
218,388,000	-3	0	27000	No Data	-533	4 out 6	0.667	0	-28
8,877,088,000	-6	0.1	10083000	-9	-1055824	3 out 6	0.5	5870	-22
7,064,678,000	-5	0	2585000	-22	-1326151	4 out 6	0.667	367	-9
1,782,711,000		0	878000	7	-273808	3 out 5	0.6	434	-12
1,447,067,000	5					Not an Exporter		0	No Data
2,562,870,000	7	0	865000	58	295	3 out 6	0.5	0	7
953,949,000	-3	0	73,000	No Data	48	2 out 5	0.4	0	56
1,804,534,000	2	0	5,000	73	-14	4 out 5	0.8	0	73
986,067,000	0	0.2	1,824,000	17	1,797,000	1 out 6	0.167	0	0

Source of Products	Food Group	Products	Products Exported by Bangladesh and Classified According to the Harmonized Commodity Description and Coding System (HS)
Products in which a Zila in the AOI is a top 10% national producer	Summer (Kharif) Vegetables	Cucumber	Cucumbers and gherkins, fresh or chilled
			Cucumbers and gherkins provisionally preserved, e.g. by sulphur dioxide gas, in brine, in sulphur water or in other preservative solutions, but unsuitable in that state for immediate consumption
			Cucumbers and gherkins, prepared or preserved by vinegar or acetic acid
		Green Banana	Bananas, incl. plantains, fresh or dried
		Winter (Rabi) Vegetables	Cabbage
	Fresh or chilled spinach, New Zealand spinach and orache spinach		
	Spinach, New Zealand spinach and orache spinach, uncooked or cooked by steaming or by boiling in water, frozen		
	Fresh or chilled carrots and turnips		
	Flowers	Roses	Cut flowers and flower buds of a kind suitable for bouquets or for ornamental purposes, fresh, HS Code: 0603

Quantitative Criteria									
Product Competitiveness		Bangladesh International Trade Potential				Regional Competitiveness of a Product Exported by Bangladesh		Trade with India	
World Import Market Size (USD)	World Import Value Growth Trend (%; 2012-2016)	Bangladesh Share in World Exports (%)	Bangladesh Export Value(2016)	Bangladesh Export Value Growth Trend (2012-2016)	Trade Imbalance (Exports vs. Imports) (USD Thousand)	Regional Competitiveness (Rank among South Asian Association for Regional Cooperation)	Product Market Size with India (Value, 2016)	Annual Growth in Value India Imports from the world (%; 2012-2016)	
2,403,410,000	1	0	119000	-16	115	3 out 5	0.6	0	0
99,499,000	0	0	0	0	0	Not an exporter		0	-20
528,583,000	-2	0	21000	20	8	4 out 5	0.8	0	20
14,175,188,000	2	0	954,000	32	931	4 out 7	0.571	0	32
939,921,000	0	0	3,000	0	-48	4 out 6	0.667	0	0
296,942,000	10	0.1	173,000	38	171	1 out 2	0.5	0	0
281,995,000	3		Not an Exporter			Not an exporter		0	0
1,277,698,000	1	0	7,000	14	-1,636	4 out 6	0.667	0	0
7,869,492,000	-3	0	1,000	-50	-219	5 out 6	0.833	0	18

## Annex E. References

- Ahmed, M. K., Halim, S., & Sultana, S. (2012). Participation of women in aquaculture in three coastal districts of Bangladesh: Approaches toward sustainable livelihood. *World Journal of Agricultural Sciences*, 8(3), 253-268.
- Asian Development Bank. (2010). Environmental Assessment Report. BAN: Padma Multipurpose Bridge Project. Retrieved from <https://www.adb.org/sites/default/files/linked-documents/35049-01-ban-eiaab.pdf>
- Asian Development Bank. (2016). Strategic master plan for Chittagong port. Retrieved from <https://www.adb.org/sites/default/files/project-document/183636/45078-001-tacr-01-part-1.pdf>
- Bangladesh Bureau of Statistics. (2011). Occupation, 2011, Bangladesh Population & Housing Census 2011.
- Bangladesh Bureau of Statistics. (2011). Age, 2011, Bangladesh Population & Housing Census 2011.
- Bangladesh Bureau of Statistics. (2017). The Yearbook of Agriculture Statistics- 2016. Retrieved from [http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/1b1eb817\\_9325\\_4354\\_a756\\_3d18412203e2/Yearbook-2016-Final-19-06-2017.pdf](http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/1b1eb817_9325_4354_a756_3d18412203e2/Yearbook-2016-Final-19-06-2017.pdf)
- CARE Bangladesh. (2015). Women's engagement contributing to women's empowerment in the Dairy Value Chain in Rural Bangladesh. Retrieved from [http://www.care.org/sites/default/files/documents/sdvc\\_womens\\_empowerment.pdf](http://www.care.org/sites/default/files/documents/sdvc_womens_empowerment.pdf)
- Chowdhury, A. R., and Khan, F. (2015). Cut flower export from Bangladesh: Prospects, challenges, and propositions. *Manarat International University Studies*, 5(1), 11-21. Retrieved from <http://miurs.manarat.ac.bd/download/Issue-05/02.pdf>
- Dasgupta, S., Huq, M., Mustafa, M. G., Sobhan, M. I., & Wheeler, D. (2017). The impact of aquatic salinization on fish habitats and poor communities in a changing climate: evidence from southwest coastal Bangladesh. *Ecological economics*, 139, 128-139.
- Elster, J. (1989). Social norms and economic theory. *Journal of economic perspectives*, 3(4), 99-117.
- Food and Agriculture Organization of the United Nation. (2017). Women's empowerment in aquaculture in Bangladesh and Indonesia: Insights from four case studies. Retrieved from <http://www.fao.org/3/a-i7113e.pdf>
- Haque, M. A., Miah, M. M., Hossain, S., & Sharifuzzaman, S. M. (2012). Agro-economic analysis of tuberose cultivation in selected areas of Bangladesh. *Bangladesh Journal of Agricultural Research*, 37(3), 457-464.
- Mahmuduzzaman, M., Ahmed, Z. U., Nuruzzaman, A. K. M., & Ahmed, F. R. S. (2014). Causes of salinity intrusion in coastal belt of Bangladesh. *International Journal of Plant Research*, 4(4A), 8-13.
- McKinsey & Company. (2011). Bangladesh's ready-made garments landscape: The challenge of growth. Retrieved from [http://www.wiwiw.fu-berlin.de/forschung/Garments/Medien/2011\\_McKinsey\\_Bangladesh\\_Case\\_Study.pdf](http://www.wiwiw.fu-berlin.de/forschung/Garments/Medien/2011_McKinsey_Bangladesh_Case_Study.pdf)
- Mou, H. N. (2012) Profitability of flower production and marketing system of Bangladesh. *Bangladesh Journal of agricultural Research*, 37 (1), 77-95. Retrieved from <https://www.banglajol.info/index.php/BJAR/article/download/11179/8166>
- Porter, M. (1985). The value chain. *The Value Chain and Competitive advantage: creating and sustaining superior performance*.

- SME Foundation, Ministry of Industries, Government of the People's Republic of Bangladesh. (2015). SME Women Entrepreneurs Directory. Retrieved from <http://www.smef.org.bd/v2/index.php/publication/2015-01-12-05-40-06>
- SME Foundation, Ministry of Industries, Government of the People's Republic of Bangladesh. (2013). SME Clusters in Bangladesh. Retrieved from [http://www.smef.org.bd/media/publication/sme\\_cluster\\_bd\\_smef.pdf](http://www.smef.org.bd/media/publication/sme_cluster_bd_smef.pdf)
- The Observatory of Economic Complexity [OEC]. (2017). Retrieved from <https://atlas.media.mit.edu/en/profile/country/bgd/>
- The World Bank Data Bank. (2018). Labor force participation rate, female (% of female population ages 15-64) (modeled ILO estimate). Retrieved from <https://data.worldbank.org/indicator/SL.TLF.ACTI.FE.ZS?end=2017&locations=BD&start=2005>
- The World Bank Data Bank. (2018). Labor force participation rate, male (% of female population ages 15-64) (modeled ILO estimate). Retrieved from <https://data.worldbank.org/indicator/SL.TLF.ACTI.MA.ZS?locations=BD>
- World Economic Forum. (2017). The Global Gender Gap Report. Retrieved from [http://www3.weforum.org/docs/WEF\\_GGGR\\_2017.pdf](http://www3.weforum.org/docs/WEF_GGGR_2017.pdf)

# Economic Empowerment of Women through Resilient Agriculture Supply Chains:

A Geospatial and Temporal Analysis in Southwestern Bangladesh

