

## Article

# Sustainable Rural Development: Initiatives in Ameliorating Key Drivers of Rural Economy and Associated Challenges in Achieving SDGs in Bangladesh

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Received: Aug 24, 2021; Accepted: Sep 24, 2021; Published: Dec 30, 2021

**Abstract:** After achieving significant progress in the millennium development era, Bangladesh has also embraced sustainable development goals (SDGs), and to successfully attain these goals, sustainable rural development is inevitable. Hence, the government has taken initiatives to spur rural growth by ameliorating the main drivers of the rural economy. The country has already reached its sixth year of SDG implementation, and it is a decent time to assess the direction in which SDG implementation work regarding rural development is moving because insightful lessons from the assessment help raise the efficacy of efforts over the coming years. Therefore, the Preferred Items for Systematic Review and Meta-Analyses (PRISMA) protocol is proposed to investigate efforts to ameliorate the highest priority areas between 2015 and 2021 and identify challenges that call for further attention. The findings indicate that despite the last six years of public and private efforts that have significantly advanced the rural economy, the following still impedes expected outcomes: complexities in allocation and utilization of development funds, technology backwardness, coordination complexities between public and private stakeholders, lack of capacity in managing and adapting climate-related risks, unethical practice in the health and education sector, social inequalities, low digital literacy, and the dissonance among education, industry, skill, and employment sector. Based on those identified issues, this article provides possible policy and strategy recommendations.

**Keywords:** Rural development, Sustainable Development Goals (SDGs), Rural economy; Bangladesh

## 1. Introduction

The term ‘Rural development’ appeared in the 1940s and was mainly concerned with agricultural development. However, the concept was brought to the forefront of growth in 1973, when rural poverty in developing countries posed a bottleneck for their economic, social, and environmental development. Hence, designing development strategies became inevitable in eradicating poverty (Karl, F., 1993). Over the years, many developmental efforts and programs aimed at ameliorating rural growth in these regions have resulted in significant progress, but still, among 43.81% of the global rural residents, 48.35% who resides in developing countries, of which 80% are abysmal, and 75% are moderately needy (Castaneda, R.A. et al., 2016; UNCTADstat, 2020). Rural inhabitants from these regions face long-standing barriers in accessing inputs, energy, technology, knowledge, services, and organizations. Moreover, unsustainable agricultural practices, urbanization, and deforestation are linked to natural resource scarcity and environmental damage. The social and political upheavals linked to unemployment, high illiteracy rates, sparse physical infrastructure and health facilities, weakly consolidated value chains, profound human capacity gaps, and urban migration obstruct regional growth. Many rural households manage to sustain an income level just above the poverty line, and those with no savings and little state support are most vulnerable to socio-economic shocks. Compared to males, rural women encounter more constraints while accumulating assets and accessing necessities. In addition, gender-based discrimination, lack of formal control over land, low social protection, institutional constraints on flourishing entrepreneurship, and lack of facilities to participate in integrated value chains hinder their transition paths for productive livelihood (FAO, 2017; IFAD, 2016, 2019; Mihai, F.C. & Latu, C., 2020).

Developing countries like Bangladesh, with large rural populations (nearly 62.6%), which play a crucial role in socio-economic development, have recently embraced the Sustainable Development Goals (SDGs) (Rahman, M., 2020). In achieving these goals and spurring rural growth, the government is also undertaking various schemes besides working on the policy

process. These initiatives aim to improve transport facilitation and upgrade education, community health, water and sanitation, and electrification access. Sustainable approaches in the agriculture sector are given furthest importance to ensure food security and resolve nutrition issues. In addition, focuses on empowering women, climate risk mitigation strategies, and enhancing digital literacy are parallelly given priority (Hossain, M., 2015; Khatun, F. et al., 2019).

However, it is reported that some of the critical areas that require development initiatives were not aligned with the earlier plans. The concept 'localizing SDGs' has received much attention in recent years, but no precise institutional mechanisms have been adopted to integrate the local government institutions (LGIs). Besides, challenges related to institutions, planning, finance, monitoring, and review also call for further scrutinized analysis (Khatun, F. et al., 2019; Rahman, M., 2020). Therefore, as the country has already reached its sixth year of SDG implementation, it is necessary to assess the direction and effectiveness of the implementation regarding rural development to begin drawing lessons and assessing challenges to implementing improvements. The past six years' insights help raise the efficacy of SDG implementation over the years leading up to 2030.

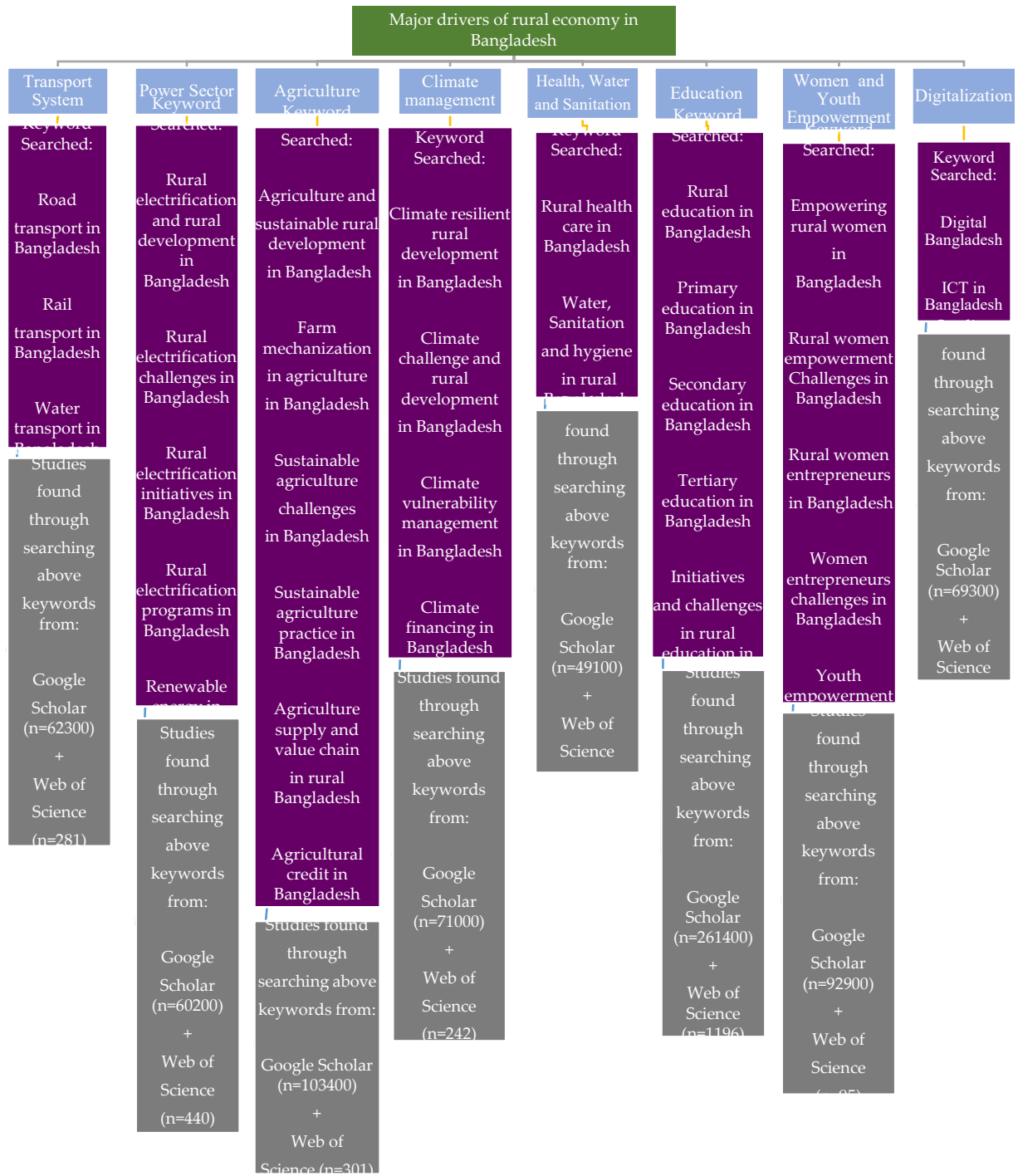
To our knowledge, very few Bangladeshi studies related to rural development have also integrated SDGs, and those studies focused on either a specific field or environment or resource management issues (Ahmed, S. & Eklund, E., 2019; Aziz, A., 2020; Ghosh, P.K. et al., 2017; Muhammad, F. et al., 2017; Noor, R., 2020; Rahman, Md.A., 2018; Rahman, T.Md., 2017). Hence, to fill the gap, we aim to provide a succinct synopsis of major initiatives taken in the last six years to ameliorate the significant drivers of the rural economy in Bangladesh and related obstacles that require immediate attention to achieve SDGs. The study results provide possible policy and strategy recommendations based on identified development obstacles.

## 2. Materials and Methods

In this study, the progression of the transportation system, power sector, agriculture, community health, water and sanitation, education, climate risk management, digitalization, and women empowerment are considered critical drivers of Bangladesh's rural economy. Among the eight drivers, the first six were chosen based on Japan International Cooperation Agencies (JICA) 'Development Objectives Chart on Rural Development' (JICA, 2002), while digitalization and women empowerment were selected based on the Food and Agriculture Organizations (FAOs) proposition (Richardson, D., 1997; FAO, 1996). Besides, SDG achievements also rely on the development of these eight drivers.

Therefore, to obtain study results related to recent development initiatives of these drivers and the causes of their dysfunctionality, we used the data of six years (2015–2021) of time. We searched articles through Google Scholar and the Web of Science database and followed the Preferred Items for Systematic Review Recommendations' (PRISMA) outline to minimize the potential bias and assess the relevant study contents (Mohar, D. et al., 2015; Page, M.J. et al., 2021). The PRISMA method is a generic approach to synthesize different types of evidence focusing on different types of queries and has already been employed in different studies (see, e.g., Page, M.J. et al., 2021). This approach potentially benefits general readers as it provides synthesized knowledge of a topic and allows researchers to identify future research priorities and policymakers to evaluate the findings' applicability to their setting (Page, M.J. et al., 2021). Additionally, we have also accessed English newspaper articles, public and private documents to obtain recent data.

In the primary stage, 749224 studies were initially found from two databases, employing the mentioned keywords, as depicted in Fig. 1.



**Fig. 1.** Primary search protocol of the study.

After that, 3247 studies were primarily obtained, and then these studies were assessed through screening, eligibility, and inclusion process (Fig. 2).



**Fig. 2.** Methods to obtain papers after the identification, screening, eligibility phases, and snowball search.

In the screening step, we obtained 1137 studies after removing 525 duplicated items and 1573 items with unrelated focuses. These studies were further assessed for eligibility. In the eligibility step, 1078 articles were again excluded due to irrelevant content and unavailability of recent data. Thus, for final inclusion, we obtained 50 papers. However, after obtaining 50 studies, the snowball search method (to obtain missing relevant articles published in obscure journals) for each item was undertaken (Lecy, J.D. & Beatty, K.E., 2012; Wohlin, C., 2014), and 20 studies were obtained through this method. Therefore, finally, 70 (50+20) full-text relevant articles were obtained and reviewed. Besides, recent published reports and newspaper articles were included to provide updated information.

### 3. Results and Discussions

Based on the review of 70 articles and other findings, the following sections provide an overview of the recent initiatives and associated obstacles to forward the drivers of the Bangladeshi rural economy towards achieving SDGs.

#### 3.1 Transport system

Rural accessibility is crucial for initiating and sustaining Bangladesh's economic growth and enables achieving several SDGs (Cook, J.R. et al., 2017). Although rural transport system development has been a significant focus for the government since its independence, further initiatives to introduce more broad-based programs emphasizing the extension of transportation in remote and poverty-stricken areas have been taken recently. New policies such as the National Integrated Multimodal Transport Policy (NIMTP), the 7th and 8th Five-Year Plan, and the Perspective Plan 2021-2041 emphasize the urge to develop integrated multimodal sustainable transportation systems by efficiently interconnecting roads, rails, and waterways by 2041 (Chowdhury, M.S., 2016; Laila, S.N., 2021). Development tasks were given to the Local Government Engineering Department (LGED), Local Government Institutions (LGIs), Bangladesh Railway (BR), Bangladesh Inland Water Transport Authority (BIWTA), and Bangladesh Inland Water Transport Corporation (BIWTC).

**Table 1.** Transformative rural transport development initiatives from FY2014-15 to FY2018-19

Authorities	Activities	Outcome
LGED and LGIs	<p><b>Constructed:</b></p> <ul style="list-style-type: none"> <li>✓ 29937 km of rural roads,</li> <li>✓ 149277 m bridge and culvert,</li> <li>✓ 363 growth centers,</li> <li>✓ 523 weekly markets,</li> <li>✓ 327-cyclone shelters</li> </ul>	<ul style="list-style-type: none"> <li>✓ Stimulated economic resources,</li> <li>✓ Reduced rural transport scanty,</li> <li>✓ Brought ample facilities to rural mobility and public amenities,</li> <li>✓ Enhanced employment generation opportunities.</li> <li>✓ Increased school attendance for boys by 24 % and girls 59 %,</li> <li>✓ Reduced vehicle operation cost by 40 %,</li> <li>✓ Enhanced health care and family planning facilities by 37 %,</li> <li>✓ Reduced travel time by 60 % for motorized and 40 % for non-motorized vehicles,</li> <li>✓ Increased traders and buyers engagement by 16 and 25 % in rural areas.</li> </ul>
BR	<ul style="list-style-type: none"> <li>✓ <b>Executing:</b> Railways Master plan (2016-2045)</li> <li>✓ <b>Expanded:</b> Rail route from 2877 km in 2015 to 2955.53 km in 2018</li> </ul>	
BIWTA and BIWTC	<ul style="list-style-type: none"> <li>✓ <b>Executed:</b> 612.96 lakh cubic meters capital dredging and 357.14 lakh cubic meters maintenance dredging</li> <li>✓ <b>Procured:</b> 7 dredgers including 4 amphibian dredgers, 20 ancillary vessels, and 60721 accessory vessels.</li> <li>✓ <b>Repaired:</b> 672 different pontoons</li> <li>✓ <b>Constructed:</b> 110 new pontoons and new structures in 96 quays.</li> </ul>	

**Source:** Authors compilation from (BR, 2018; Hossain, M.A.A., 2019; LGED, 2015, 2019; MoF, 2021; The World Bank, 2020a).

The government has also aimed at constructing 3,140 km of new roads and 18,500 m of bridges and culverts in rural areas by FY2021–22. A maintenance project of 8,500 km of metaled roads, 3,800 m of bridges and culverts, and rural roads classified as 'good' from 43 to 80% are in implanting process (ADB, 2020). To support the government in enhancing the road transport sector, the Asian Development Bank (ADB) has approved USD 300 million, and the World Bank USD 500 million (ADB, 2020; Prothom Alo, 2020). To ameliorate the railway sector, the government has also taken the initiative to construct 900 km dual gauge double track, 1,581 km of new track, refurbishment of 1,527 km rail track and 100 passenger coaches, procurement of 31 locomotives, and improvement of the signaling system at 222 stations (Dhaka Tribune, 2020a). In addition, the Bangladesh inland water transport corporation (BIWTC) is also building two K-type ferries, two internal passenger ships, and two coastal passenger ships. The government is also trying to ensure water transportation safety by implementing shipping laws (MoF, 2021).

However, less than half of the rural population has access to all-weather roads, and 28.98% of rural roads still suffer from quality construction and maintenance constraints (ADB, 2020; RHD, 2018). Moreover, around 3,900 km of inland waterways can transport only 12% of rural communities. Major navigation channels suffer from low maintenance, and most river port facilities have dilapidated with unsafe conditions (The World Bank, 2016; Rashid, K. & Islam, M.R., 2017). Besides, rail transportation fails to reach all over the country due to various operating bottlenecks (i.e., different gauge systems at different regions, missing rail links, and speed restrictions) (Ahsan, H.M. et al., 2016). In addition, inconsistencies in the planning and execution process, investment allocation and utilization complexities, coordination gap among various surface transportation agencies and ministries, irregularities

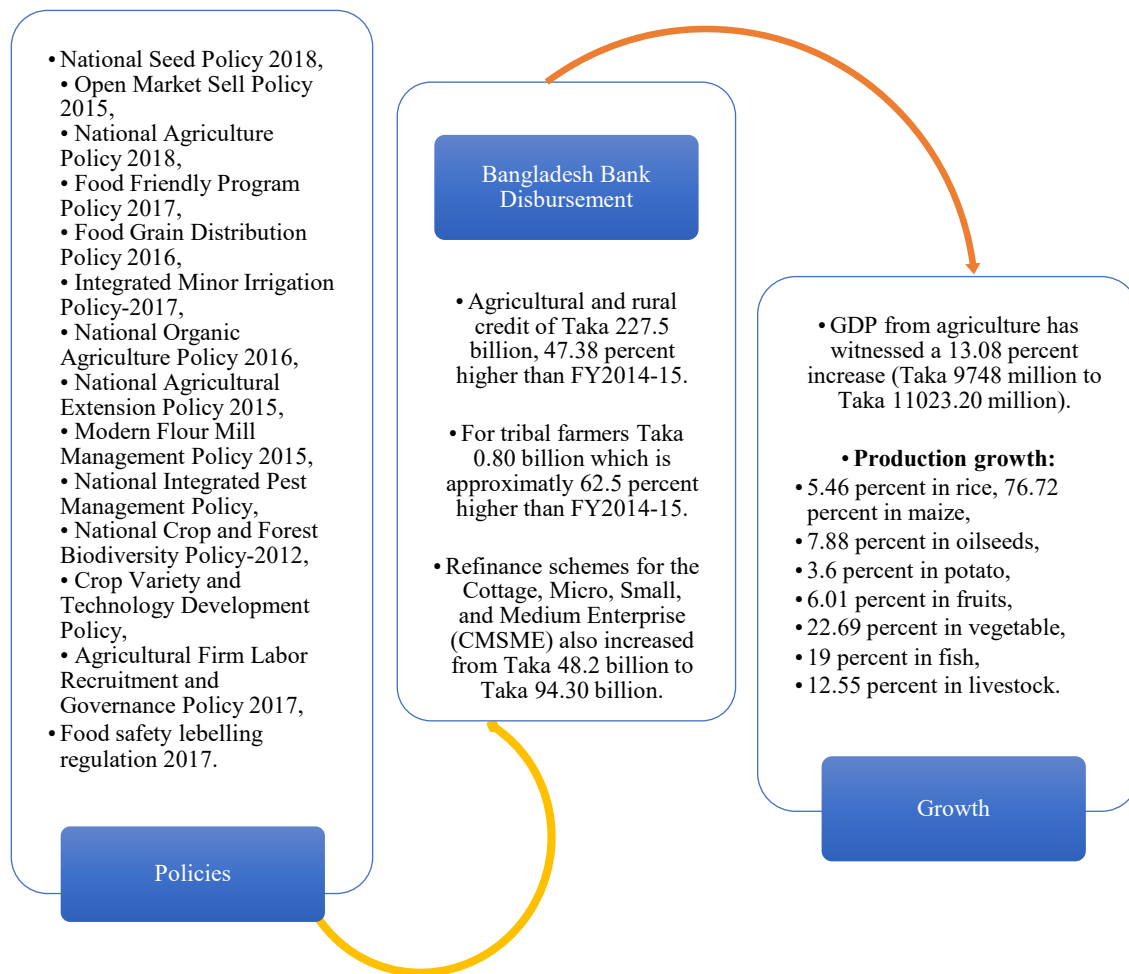
and employing improper methodology in construction, maintenance inadequacy, availability of skill labors, suitable materials and equipment, and inadequate disaster preparedness strategies are preventing to achieve the intended benefits from the development initiatives (Ahmed, S. & Eklund, E., 2019; Alam, M.J. et al., 2020; Chowdhury, M.S., 2016; Rashid, K. & Islam, M.R., 2017; UNESCAP, 2019).

### 3.2 Power sector

As for proceeding towards achieving SDG 7 and partly SDG 11, the government has formulated power system master plan 2016, the 7th five-year plan (2016–2020), gas sector master plan 2017, and the 8th five-year development plan (2020–2025) to formulate comprehensive energy and power development plan, complied with the strategy of diversifying primary fuel supply and regional balancing (the Financial Express, 2021). Due to the progressive efforts from the policymakers, effective participation by the private entrepreneurs, and support from the development partners, the country has managed to increase the power generation capacity from 10939 to 20383 MW between FY2014–15 and FY2019–20 (BPDB, 2021). As a result, the rural household electrification access rate has enhanced from 64.95 to 88.85 % during this time (World Bank, 2020a). This progression has stimulated rural literacy, information accessibility, employment opportunity, and income-generating activities (Mollik, S. et al., 2016; Samad, H. & Zhang, F., 2017). To mitigate the demand-supply gap and ensure uninterrupted, affordable, and quality energy supply, 3,840 MW power generation projects at Payra, Maheshkhali, and Matarbari areas are now undergoing (the Financial Express, 2020b). Besides, to reduce system loss, pilferage, and overbilling issue, the government has also proposed to install 8.8 million prepaid meters across the country by FY 2020–21, and among those, 2,50,000 million meters allocated for rural areas. Till October 2019, Bangladesh Rural Electrification Board (BREB) has successfully installed 8,10,590 m and expects to achieve the target within the expected timeframe (Maruf, Md.H. et al., 2020). In addition, promoting renewable energy and reducing stress to the centralized electricity supply through increasing the Solar Home System (SHS) rate has gained remarkable popularity among rural people (Kabir, E. et al., 2017; Jones, N. & Warren, P., 2020). The government plans to purchase surplus electricity from solar-irrigation projects to meet 10 % of the nation's electricity requirements (Khan, I., 2019). However, the sectorial growth is interrupting due to lack of skill, technical and financial support essential for strengthening the distribution of coverage and the quality of service, power theft, the raising per unit cost of power generation due to capacity payments of plants that are sitting idle and inadequate renewable energy integration (Noor, R., 2020; Mollik, S. et al., 2016; Nicholas, S. & Ahmed, S.J., 2020; Maruf, Md.H. et al., 2020; Karim, R. et al., 2020).

### 3.3. Agriculture

In achieving SDG 2, the country has emphasized implementing a safe food production system, crop diversification method to improve the nutritional status of people, efficient use of inputs and adoption of new technologies for higher farm productivity, and increasing investment through international cooperation in rural to enhance productivity capacity (GED, 2020). The country so far has made practical and sustainable gains, which reflects in new policies, expenditures purposes, and the growth trajectory (Fig. 3). Besides, for ensuring sustainable water supply around the year for agro-activities, reducing depletion of fossil fuel reserves, and providing farmers with opportunities to utilize their spare time for other productive purposes, the government, through Infrastructure Development Company (IDCOL) and Barind Multipurpose Development Authority (BMDA) has successfully installed around 1600 solar-powered pumps by 2019 (Sayeed, Md.S.I. et al., 2020). The country expects to have 50,000 solar irrigation pumps installed by 2025 (Sayeed, Md.S.I. et al., 2020). In FY2019–20, a project worth Taka 4.15 billion was launched to facilitate subsidy to farmers and farm equipment renters for buying 3,000 combine harvesters, 2,000 reapers, and 300 transplanters during harvesting season (Byron, R.K. & Parvez, S., 2019). Besides, Taka 1 billion's government allocation provided an opportunity for 'Haor' region farmers to avail a 70% subsidy on the farm machinery purchase and 50% subsidy opportunities for other regions (The Financial Express, 2020a). Subsequently, agricultural export subsidies increased from USD 54.71 million to USD 73.7 million between 2015 and 2020. The government has recently taken up an investment project of Taka 31.98 billion to promote farm mechanization for reducing the labor shortage problem during the crop harvesting seasons and allocate Taka 11.5 billion to provide incentives and farm subsidies purposes (Amin, M.A., 2020). Such initiatives play an important role in reducing food loss, increasing productivity in agriculture, and providing self-sufficiency to the rural population (Koizumi, T., 2018).



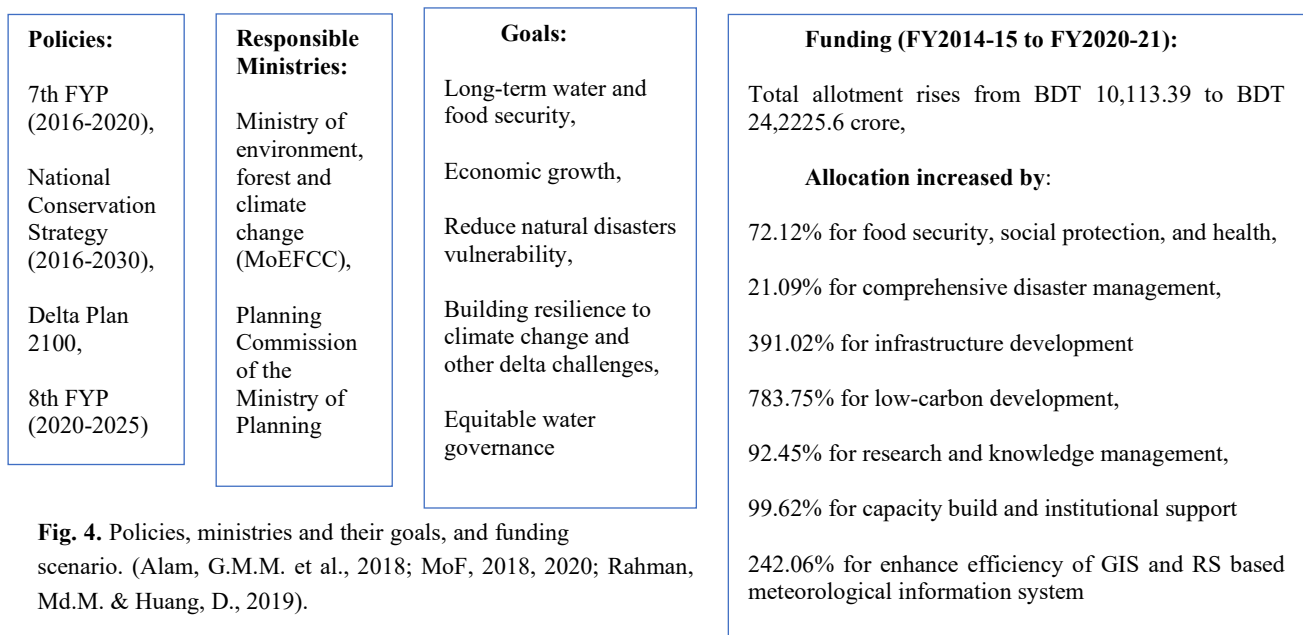
**Fig. 3.** Policies, expenditure purposes, and the growth trajectory from FY2014-15 to FY2019-20 (Bangladesh Bank, 2016, 2020; BBS, 2016, 2021b; DLS, 2020; Trading Economics, 2020).

Although the combined efforts of government, private organizations, and farmers have resulted in increased productivity yet, there are still climate vulnerabilities, labor crisis, technological backwardness, farmers' lack of knowledge in scientific and diversified farming methods, lack of extension services, and marketing complicity of high-value crop limit sectorial growth (Ali, M.P. et al., 2020; Das, M. et al., 2018; Kamal, M. et al., 2019; Masud, A.A. et al., 2020; Quddus, A. & Kropp, J.D., 2020; Sunny, F. A. et al., 2018). Government policy and service implication catastrophe due to coordination, finance, monitoring, and transparency complexities, domestic producers' capacity limitation, and complexities in the diffusion of large-scale organic farming hinder this sector's potential expansion. Besides, land fragmentation and the limited size of farms prevent cost efficiencies from economies of scale (World Bank, 2020b). In addition, the nonexistence of farmer organizations, the existence of syndicates or middlemen, inadequate training facilities, limited access to current market information, complexity in integrating small farmers into the value chain, knowledge deficiency in formal subsidy procedures, lack of insurance facilities, and larger farmers' superior connectivity with the credit providers impede agricultural growth and the rural farmers' empowerment in Bangladesh (Ferdous, Z. et al., 2020; Fuad, M.A.F. & Flora, U.M.A., 2019; Islam, M.A., 2018; Karim, R. & Biswas, J., 2016; Mahmud, K.T. et al., 2017; Quddus, A. & Kropp, J.D., 2020; Rahman, M.S. et al., 2018; Sarker, M.N.I., 2016; Shamsuzzaman, M.M. et al., 2020).

### 3.4. Climate vulnerability management

Bangladesh is among the topmost vulnerable countries to climate change globally and compared to urban, the countries' rural areas are more vulnerable to disasters (Seddiky, Md.A. et al., 2020). It is estimated that if the growing threat of altered environments is not addressed appropriately, the country will lose 16% of its land surface and 30% of its food production by 2050 (MoF, 2020).

Hence, to build resilience against climate threats and achieve SDG-13, many climate change-related policies and plans have been formulated, and mitigation programs have been operationalized.



**Fig. 4.** Policies, ministries and their goals, and funding scenario. (Alam, G.M.M. et al., 2018; MoF, 2018, 2020; Rahman, Md.M. & Huang, D., 2019).

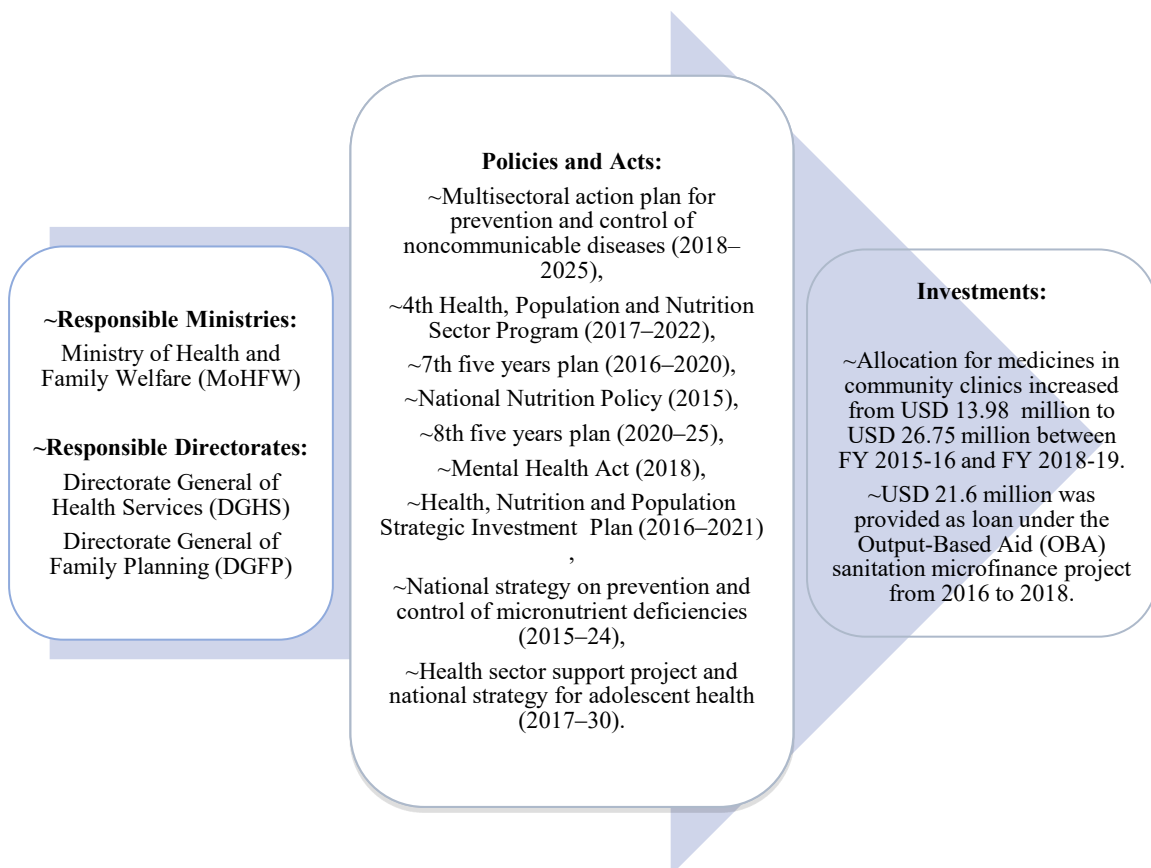
In mitigating climate vulnerabilities, various rural development programs are undergoing: developing climate-resilient rural infrastructure, coastal afforestation scheme, char development settlement programs, climate-resilient ecosystem, and livelihoods improvement projects, climate-smart irrigation and water management programs, flood management programs, sustainable agriculture practice, livestock and fisheries enhancement schemes, small farmers development programs, strengthening property rights program, and economic empowerment of the poorest and vulnerable groups (MoF, 2018, 2020). Besides, more than 2,500 registered NGOs act as resource personnel and deliver numerous community-level programs (Lopa, F.G.R. & Ahmad, M.M., 2016; Seddiky, Md.A. et al., 2020). Due to government and NGO support, farmers in complex climatic regions have started adopting various salinity and heat-tolerant varieties. Cage fishing, floating and homestead gardening, semi-scavenging method of goat and poultry farming, and integrated farming are also gaining popularity among small farmers in climate-vulnerable areas (Sutradhar, L.C. et al., 2015; Shirazy, B.J. et al., 2016; Rashid, M. A. & Hossain, T.M.B., 2016; Rahaman, M.A. et al., 2019; Chowdhury, R.B. & Moore, G.A., 2017). Apart from those, several private organizations facilitate rainwater harvesting technology at subsidized rates in arsenic and saline-prone areas and provide weather index-based agriculture insurance in rural (Hasan, Md.T., 2019; Samaddar, S. et al., 2018).

Despite the increased resilience, climate vulnerability management initiatives fail to achieve the expected outcomes due to the absence of accountable financing mechanisms, technology scaling up complexities, incorporating rural women as active agents in climate adaptation agendas, and lack of safety net protection (Abdullah, H.M. & Rahman, M.M., 2015; Rahman, Md.A., 2018; Tanjeela, M. & Rutherford, S., 2018). Moreover, the national agriculture policy (2013) and the national food policy plan of action (2008–2015) have recognized the threats of climate change and emphasized the development of climate change-related early warning systems to deal with food production risks. However, these policies failed to recognize the necessity of agro-ecological zone-based climate-resilient action plans, research, and strategies (Rahaman, M.A. et al., 2019). Bangladesh's climate change adaptation emphasizes structural and technical approaches and overlooks its socio-cultural attachments with humans and nature. Therefore, Ecosystem Services Based Climate Change Adaptation (EbA) approaches are still underappreciated (Huq, N. et al., 2017). Besides, international actors' training and outreach activities for stakeholders often fail to achieve the intended impact due to the lack of sustainable practice (Rahman, Md.S. et al., 2020). Most Bangladeshi NGOs' lack of expertise and resource deficiency adversely impacts the quality of climate-adaptive schemes (Seddiky, Md.A. et al., 2020).



### 3.5. Community health, water, and sanitation

To attain SDG 3, the government has formulated several policies and increased investment in the health, water, and sanitation sector in recent years. The government aims to improve the equity, quality, and efficiency of previous initiatives crucial to strengthening the health system to achieve sustainability by 2030. Presently, around 424 primary care hospitals at the sub-district (Upazila), around 62 secondary hospitals in the districts, and more than 13907 community clinics (CC) are in operation, and initiatives in expanding these facilities in different remote regions are headway [(DGHS, 2020)]. In FY2018–19, the government has implemented the Multidisciplinary Health Volunteer (MHV) program. So far, the establishment of 404 new CCs and renovation work of 791 has been completed, while the construction work of another 625 and renovation work of 1209 is ongoing. Besides, scale-up Child Development Center (CDC) facilities from 15 to 40 in the next four years are in the process (DGHS, 2020). The health-financing scheme Shasthyo Suroksha Karmasuchi (SSK) is providing free hospital services to the below-poverty population, and the Maternal Health Voucher Scheme (MHVS) currently operating in 55 Upazilas aims at ensuring safe delivery of poor pregnant mothers (Joarder, T. et al., 2019). In addition, the role of NGOs, multilateral, and donor agencies in shaping the health sector is also invaluable. Besides implementing social and behavioral change programs, immunization programs, maternal mortality reduction programs, and programs to enhance mother and child health in rural areas, they also strengthen health policy frameworks (Joarder, T. et al., 2019).



**Fig. 5.** Ministries involvement, recent policies and acts, and investment provision from 2015 to 2021 (Ahmed, R., 2019; DGHS, 2020).

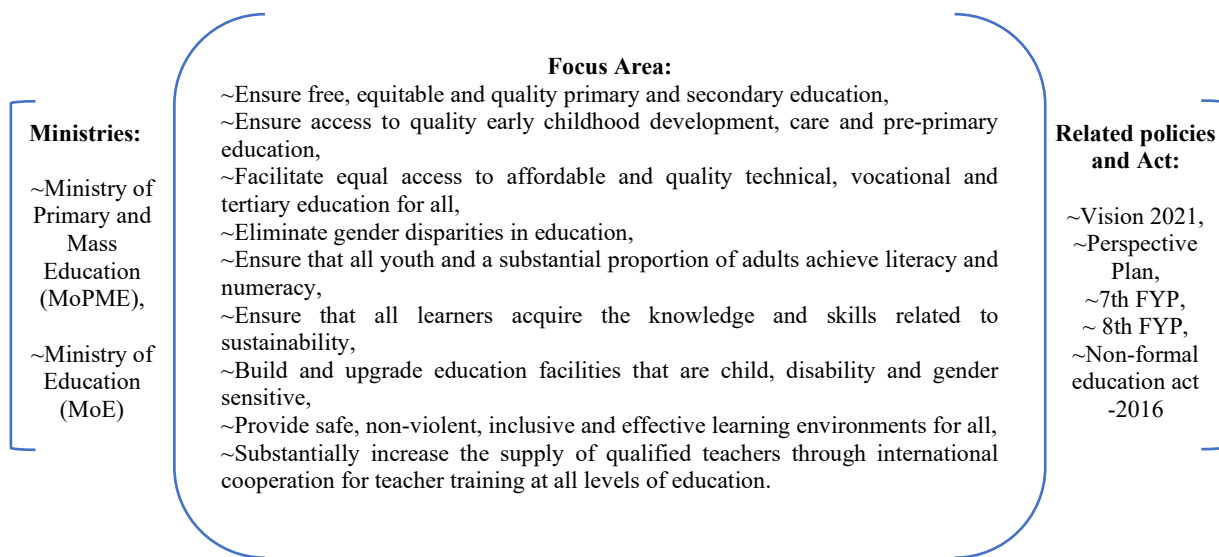
On the other hand, the Output-Based Aid (OBA) sanitation microfinance project from 2016 to 2018 and the 'Rural Water Supply and Sanitation Project' from 2012 to 2017 have advanced the country's journey towards advancing SDG 6. The OBA scheme provided loans to nearly 170,679 rural households to construct improved sanitation facilities, helped 1,570 local sanitation entrepreneurs to sell their products, and provided loans to 1,031 local sanitation entrepreneurs for business expansion. The other project has provided more than 1.48 million people with improved water sources and facilitated hygienic latrines to 247500 thousand people (Ahmed, R., 2019; The World Bank, 2019a). These initiatives have provided opportunities for rural households to access safe water sources and to avoid open defecation. As a result, access to sanitation increased from 30 to 65% in rural areas (The World Bank, 2019b).

In addition, the 'Rural Water, Sanitation and Hygiene for Human Capital Development Project' in the implementation stage intends to help 3.6 million people access hygienic sanitation facilities, and around 600,000 people access clean water in rural areas in 78 selected Upazilas. Under this scheme, apart from constructing 3,000 community piped water supply systems in different rural areas, 312 public toilets and 2,514 hand-washing stations at crowded public places will also be constructed. Besides, around 309,000 poorest households will receive fully subsidized toilets, and almost 1,280 community clinics will have new or renovated facilities. This project expects to complete in 2025. The total project cost is USD 550 million, in which USD 200 million is funded by the International Development Association (IDA) – a concessionary lending window of the World Bank, USD 150 million by the Bangladeshi government, and the rest by the Asian Infrastructure Investment Bank (AIIB) (The World Bank, 2020d).

However, despite government and non-governmental efforts in enhancing rural health facilities, there remain significant challenges. A large segment in coastal regions still has limited or no access to healthcare facilities (Zafri, N.M. et al., 2021). The country also suffers from a lack of and geographic maldistribution of human resources for health. The number of registered physicians per 10,000 people is 6.73, doctors per 10000 are 1.55, medical technologists per 10000 is 0.60, and community and domiciliary health workers per 10,000 people is 2.26. Besides, for every 10000 people, the number of allocated beds in the DGHS-run public hospitals is only 3.3 and in private 5.53. The current doctor-patient ratio is only 1.1 to 10,000 people, and less than 20% of health workers currently serve nearly 63% of rural inhabitants. The situation is worse in districts or sub-districts where only 62% of the sanctioned doctors work and below 25% work more remotely (DGHS, 2020; Joarder, T. et al., 2018). Lack of career development options and poor infrastructure obstructing qualified and skilled healthcare workers from serving in rural areas, allowing unqualified or semi-qualified healthcare personnel to fill their position, posing threats to the rural healthcare sector. Besides, inefficient budgetary allocation, corruption, recruitment complexities, and associated officials' negligence impede the expected outcomes (Joarder, T. et al., 2018, 2019). In most rural areas, the elder women generation struggles to access quality healthcare due to the unavailability of gender-sensitive care (Hamiduzzaman, M. et al., 2021). Unethical business practices by many pharmaceutical companies, diagnostic centers, dispensaries, and doctors are also responsible for increasing the out-of-pocket (OOP) expenditure of rural patients and magnifying their vulnerability challenges (Khan, J.A.M. et al., 2017; Mohiuddin, A.K., 2020; Matin, M.A. et al., 2020). The government is trying to expand the micro health insurance (MHI) schemes in various parts of the country, but complexities to uptake, low renewal, and high dropouts challenge their financial sustainability (Mahmood, S.S. et al., 2018). Similarly, 40% of the rural population do not have safely managed water supply options, 35% still use unimproved sanitation facilities, and less than 1% have access to piped sewerage collection. Among 78% of rural health care equipped with improved sanitation facilities, only 12% have designated toilets for women. Many existing projects face challenges due to weak technical backstopping mechanisms, waste disposal complications, and indifference to human health and hygiene (Balasubramanya, S. et al., 2017; the World Bank, 2020d).

### 3.6. Education

To achieve SDG 4, the government in recent years has launched various schemes. Such initiatives include the fourth primary education development program (PEDP-4), higher education quality enhancement project (HEQEP), secondary education sector investment program (SESIP), teaching quality improvement (TQI) program, and secondary education quality and access enhancement project (SEQAEP). In promoting quality education, between 2015 and 2018, the government has successfully upgraded the number of educational institutions from 162158 to 171789 (BBS, 2017, 2021a). Besides, aligning the National Education Policy 2010 exercise with all new schemes has also been made to enhance this sector. Moreover, efforts to pour resources into sectorial enhancement through initiating school feeding programs, providing monthly stipends, and free textbooks have increased gross primary enrollment rates from 109.2% in 2015 to 114.2% in 2018. Tuition fee waiver schemes have also raised the net secondary school enrollment rate from 59.1 to 67.6% between 2015 and 2019 (DPE, 2019; UNESCO UIS, 2020). Due to an increasing pool of higher secondary school graduates, the tertiary enrollment rate rose from 17.9 to 24.01% between 2016 and 2019 (the World Bank, 2020b). To enhance rural literacy rates, the countries' NGOs, besides delivering technical and vocational education, also provide child and adult education. So far, concerning SDG 4, they have delivered education services to 2.9 million learners (among 61.71% are female) through 79,573 learning centers/schools, extended pre-primary education support to 700,000 learners through 25,000 centers, and offered lifelong learning facilities to 700,000 learners through 20,000 community learning centers (Rahman, M., 2020). The government, in recent years, has also introduced a new pay scale and retirement and other benefits schemes for non-government schools, colleges, and madrasa teachers. Besides, to build skilled workforces, emphasis has been given to expanding technical and vocational education. Therefore, initiatives have been taken to establish technical institutes for girls in four divisional cities, 329 new technical schools and colleges at the sub-district level, and four engineering universities in four divisions. The Madrasa and Vocational Education Board are also instructed to focus on job-oriented curriculums (Dhaka Tribune, 2020b).



**Fig. 6.** Related ministries, policies, and focus areas for education development from 2015 to 2021 (Neazy, S.N., 2018).

However, the downward trend in public funds for education seems inconsistent with the government's proclaimed goals, as expenditure has decreased from 1.54 to 1.33% between 2016 and 2020 (World Bank, 2020c). Even primary and secondary schools' enrollment escalates compared to that before, yet, 26% of rural boys and 19% of rural girls from 10 to 14 years old are still deprived of education in rural areas (Bdnews24, 2019). Although 52.7% of the institutes are located outside the central zone, only 26% of students enrolled in post-secondary education in 2019 (BANBEIS, 2020). A high degree of inequality in accessing education persists in rural compared to urban. Only 1.2% of rural females compare to 5.9% of urban females, and 3.5% of rural males compare to 11.5% of urban males have tertiary literacy (Rahman, R.I. & Islam, R., 2019). Several factors are obstructing efforts in increasing the institutional enrollment and advancement of this sector in rural. Firstly, illiteracy and poverty go hand in hand in rural Bangladesh, and most families struggle to meet their basic needs. Hence, governments' free offerings in most cases fail to motivate parents, and children are sent to fields instead of attending school. Secondly, exploiting funds due to corruption and failure of generalized education projects due to overlooking area-specific different socioeconomic factors pose barriers to development (Rahman, R.I. & Islam, R., 2019; Sarker, M.N.I. et al., 2019). In addition, fragmented legislative backbone and weak coordination mechanism, the dissonance between academia and industry, corruption and nepotism in recruitment and student enrollments process, rote learning accompanied by low stakes assessment, students' passivity, lack of initiatives in teachers' performance appraisal and professional amelioration opportunities, research fund allocation complexities, and political interference are liable of producing inconsistency between supply-demand sides of education and skill productivity (Aktaruzzaman, Md. & Plunkett, M., 2017; Rahman, T. et al., 2019; Roknuzzaman, S.M. & Bong, U.S., 2020).

### 3.7. Women and Youth Empowerment

To ameliorate women's participation in mainstream activities, ensure their socio-economic rights, and enhance their capabilities, the government has increased women's development allocation from Taka 71872 crore to Taka 161247 crore between FY2015–16 and FY2019–20 (MoF, 2019). They have incorporated different policies, acts, and provisions for women's development and gender equality in line with international commitments. Initiatives such as maternal health voucher schemes for rural women, fair price cards for impoverished women-headed families, building women-friendly hospitals and growth development institutions, rural women rehabilitation centers, training programs for destitute rural women in 64 districts, and political and administrative scope expansion activities have also been implemented during this period (MOWCA, 2016). From 2017, the implementation of the Income Generating Activity (IGA) project for rural women in 426 Upazilas has so far aided 2,17,440 women to avail training on various trades (CRI, 2019a). 67500 women from 30 Upazilas from 2016 to 2020 have received training in four trades through the Promotion of Women Entrepreneurs for Economic Empowerment Project (WEDO, 2021). Similarly, the rural employment support program in 59 Upazilas, vulnerable group development scheme, livelihood protection for women in the Haor region have enabled the poorest rural women and their families to enhance their economic status (CRI, 2019a). Besides, the 'One House One Farm'

project that aims to alleviate the poverty of the rural poor by financing the agriculture project and acting as a fund mobilization source has aided nearly 1.97 beneficiaries to become self-reliant between FY 2015–16 and FY 2017–18 (RDCD, 2018).

The government also expanded school meal programs, free education, stipend facilities for girls, and education for poor autistic students (Hridi, A.P. et al., 2020; Sarker, M.N.I. et al., 2019). Due to these initiatives, the girls’ gross enrolment rate in pre-primary increased from 32.63% in 2015 to 41.63% in 2018, primary enrolment rate from 119.06% in 2017 to 120.75% in 2018, secondary enrolment rate from 69.65% in 2015 to 78.28% in 2019, and tertiary enrollment increased from 14.7% in 2016 to 20% in 2019 (Indexmundi, 2020; UNESCO UIS, 2020).

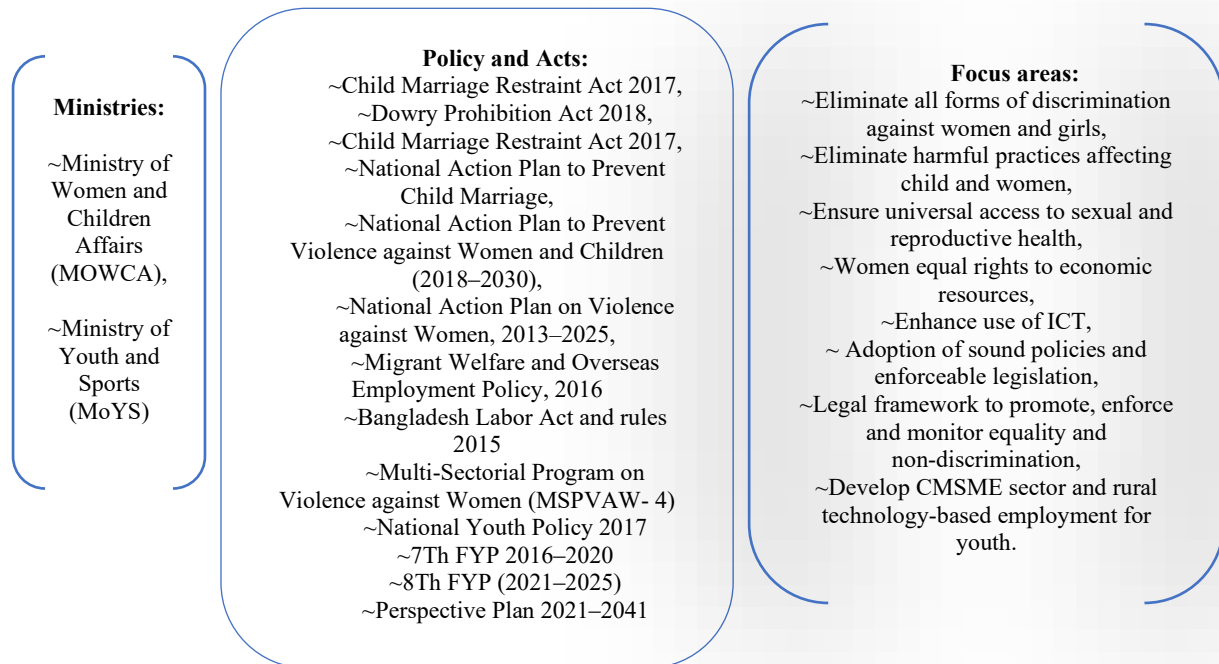


Fig. 7. Linked ministries, policies, and focal areas for women and youth development from 2015 to 2021 (ILO, 2020; MOFA, 2021).

Employment opportunities for women in primary schools increased from 59.55% in 2015 to 62.25% in 2018, in secondary raised from 22.38% in 2009 to 25.60% in 2019, and in tertiary from 22.64 to 27.08% (BANBEIS, 2020; the World Bank, 2020c). In FY 2018–19, 46.56% of female students with disabilities received stipends, and 42.38% of insolvent women with disabilities received allowances. Support also was extended to destitute girls, human trafficking victims, sex workers, and women prisoners (Alam, S., 2020; BANBEIS, 2020). The allocations for the widow, deserted, and destitute women between FY 2015–2016 and FY 2019–2020 also increased from Taka 534.34 crore to Taka 1020 crore, resulting in beneficiary increment from 1.1 to 1.7 million (Murshed, M., 2021). To prevent violence, dowry, and speedy expedited trials for tortured women and children, an inter-ministerial coordination committee and 41 new tribunals across the country have been set up (CRI, 2019a; HRW, 2020). Similarly, countries' non-governmental enterprises reach the grassroots level providing knowledge, technical and financial assistance to women to alleviate indigence from their ranks in rural areas (Akter, J. & Cheng, K., 2020; Zafarullah, H. & Nawaz, F., 2019). In 2018, among 42 million microfinance beneficiaries, around 90% of women received support for savings services and finance for self-employment in Bangladesh (MRA, 2019). Besides, in collaboration with banks and the Western Union, NGOs provide remittance services at the rural women’s doorsteps. Financial transactions became accessible in rural due to mobile and agent banking expansion and Automated Teller Machine (ATM) booths (Alam, S., 2020). Moreover, the government has increased the female entrepreneurs' loans from Taka 39.68 billion to Taka 51.78 billion from FY15 to FY20. Banks and other financial institutions have been instructed to distribute at least 15% of the total Cottage, Micro, Small, and Medium Enterprises (CMSMEs) loan among women entrepreneurs at a maximum lending cap of 9.0% under all refinancing schemes. Additionally, branches have been instructed to facilitate dedicated help desks for women entrepreneurs and provide loans up to Taka 2.5 million without collateral but against personal guarantee under the refinance scheme of the central bank (Bangladesh Bank, 2020). Moreover, around 3.07 million farmers in FY20 compared to 3.2 million in FY15 availed agricultural and rural credit, of which 1.51 million women received Taka 83.60 billion in FY20 compared to 0.3 million women received Taka 9.0 billion in FY15 from different banks (Bangladesh Bank, 2016, 2020). The government has

also established the Joyeeta Foundation to facilitate technical and financial support for women entrepreneurs in expanding business from household to commercial (CRI, 2019a). In addition, the governments' youth development programs from 2016 to June 2020 have facilitated training to 1498647 unemployed, provided employment opportunities to over five hundred thousand, given loans to 119580 youth, and planned to train another 314000 in FY 2020–21 (DYD, 2021). Apart from these initiatives, youth-focused NGOs are providing youth with leadership training and skills development in Bangladesh and at the same time advocating for their rights (Bhattacharya, D. et al., 2018).

However, despite various attention and efforts to empower rural women, challenges exist in their greater public civic, political, and labor force participation. Moreover, signs of 'empowerment' have become less pronounced in rural mainly due to the growing number of violence and child marriage incidents (Hossain, N., 2020; HRW, 2020; Putterm, M.V.D. & Jannat, A.N.E., 2020). According to Human Rights Watch (HRW), between 2016 and 2020, less than 3% of all violence victims were able to see success, and for more than 60 million women and 64 million children of the country's violence survivors, only 37 safe shelters are available (HRW, 2020). Besides, only 13% of rural women possess sole or joint land ownership (Kotikula, A. & Solotaroff, J., 2019), and around 29% of agricultural women's workforce remains unpaid (Raihan, S. & Bidisha, S.H., 2018). They are also less diverse than men regarding access to finance due to collateral dispute, suspiciousness, preconception, conservative attitude of the loan providing institutions, and other complications (Ghosh, P.K. et al., 2017). Early marriage due to illiteracy, societal pressure, and poverty-triggering early pregnancy constraints their empowerment (Hossain, N., 2020). Subsequently, gender inequality is liable for their low participation in technical and vocational education and training attainment (Raihan, S. & Bidisha, S.H., 2018). Apart from those, the rhetoric of microcredit as a development panacea of collateral-free financing mechanism enhances social dispossession by creating debt traps and re-configuring their social status in the communities (Paprocki, K., 2016). Finally, National Youth Policy 2017 addresses the unique needs of transgender youth through promoting sports, but measures for skills development and employment opportunities are not outlined (Bhattacharya, D. et al., 2018).

### 3.8. Digitalization

In recent years, the government's e-service development initiatives in coping with globalization, reducing rural-urban segregation, and advancing SDG-9(c) have improved governance quality and contributed to advancing agriculture, education, health, and financial services outreach (Hoque, M.R. & Sorwar, G., 2015; CRI, 2019b). In particular, the diffusion of DAE's and BARI's digitalized e-agriculture services and pictorial-based applications are aiding farmers in availing crop production manuals and integrated insect pest management strategies (BARI, 2020; DAE, 2020). 245 agricultural information centers and cellular mobile-based services offer farm advisory services to rural farmers (Chowhan, S. & Ghosh, S.R., 2020). Besides, more than 4 million rural people across the country are availing 200 types of services every month from 5275 digital centers established at Union levels. The centers have also provided employment opportunities to more than 12,000 rural people. Moreover, the recent initiative of transforming 8,500 post offices into e-centers also plays the supplementary role of digital centers in rural areas (CRI, 2019b). The expansion of the digital financial service (DFS) in rural areas has allowed smooth transactions for vast rural inhabitants and helped them become a part of the formal financial services. The 'Agent' banking service from 2016 until June 2020 has attracted over 7 million clients to transact Taka 102.20 billion, and 'Nagad,' since its inauguration in 2019, has acquired nearly 40 million accounts with an average daily transaction of Taka 400 crore (Dhaka Tribune, 2021; Nisha, N. et al., 2020). The healthcare sector is also witnessing progress with the adoption of District Health Information Software 2 (DHIS2), covering about 75% of public health facilities in Bangladesh (Begum, T. et al., 2020). In addition, initiatives to provide Internet connectivity at over 800 health centers, video conferencing facilities in all community clinics, rudimentary telemedicine in resource-limited areas, and mobile-based helplines with doctors in rural areas are in the implementation stage (Alam, Z.M. et al., 2020). To leverage ICT to enhance education, the government, in recent years, has provided 20000 schools with laptops and Internet connection, equipped 85% of secondary schools with ICT infrastructure and hardware, 31% of schools with ICT lab facilities, and 77% of schools with Internet connections. Due to these initiatives, 73% of schools became able to use ICT for academic purposes. Besides, the government has launched a repository for teachers to share, store and use digital learning resources. Partnering with development banks, bilateral and donor agencies, private companies, NGOs, and community-based organizations (CBOs), the government is also implementing projects and programs to support ICT use in education (Lim, C.P. et al., 2020). However, around 49% of rural households have no access to a computer, and 54% do not have Internet access. Among 96 % of the rural households that own a mobile phone, 59% do not own smartphones. Only 23% possess primary or above basic digital skills, and 16% with zero skills (Aziz, A., 2020; Aziz, A. & Naima, U., 2021; Nisha, N. et al., 2020; Shadat, W.B. et al., 2020; Stillman, L. et al., 2020).

#### 4. Conclusions and Recommendations

This study is carried out to assess what has been done in the last six years to ameliorate the key drivers of the rural economy in Bangladesh and reveal the associated challenges that require speedy attention. The results indicate that complexities in the allocation and utilization of development funds, technology advancements barriers, internal alignment and coordination of stakeholders intricacy, difficulties in confronting climate risk, unethical practices in the health and education sector, social inequalities, low digital literacy, and the dissonance between education, industry, skill, and employment opportunities are obstructing the expected outcomes despite significant public and private efforts over the past six years. Hence, to address these concerns, we propose a few recommendations.

Since corruption is already deeply ingrained in the system and institutionalized, its effective control mainly depends on the will of the political leaders. Investigating why anti-corruption efforts fail and then initiating a pragmatic and comprehensive vigorous government-willed oversight program that coordinates all levels of society helps to reinforce the effective anti-corruption strategy. Besides, to reduce the interdependence of political opportunities with business and profiteering opportunities and ensure merit-based electoral systems, initiatives to build a robust system for managing conflicts of interest backed by good governance and in case of alleged fraud and corruption are proven debarred from engaging in all activities, disclosure of interests and their potential conflict, and imposing financial penalty is essential. A conducive environment must be created for people, particularly media, civil society, and NGOs, to raise and strengthen the demand for accountability and against corruption. In addition, to reduce the size of the bureaucracy and opportunities for corruption, enhancing institutional capacity and expanding information technology solutions are essential.

While implementing rural infrastructure development projects, emphasis must be given on combined assessments of rural needs, technical and economic viability, and a more nuanced understanding of rural policies and practices. Priority-based construction and maintenance must be founded on a logical basis - with a view to phased development. Successful transportation safety plans must incorporate the '4E' concepts (education, enforcement, engineering, and emergency). Additionally, the transport system enhancement projects need to connect agricultural areas with a competitive advantage to strategic markets for swift absorption of the output produced.

For enhancing rural electrification rate, reach remote, and reduce grid dependency, it is necessary to build a market system that promotes off-grid electrification. The country needs to modify its existing renewable energy policy to attract the interest of promoters and investors in financing and developing mega solar PV projects. However, more significant land allocation issues may obstruct mega projects. Hence, rooftop solar power systems in industrial and residential buildings connected to the grid enhance power growth and support displacing fossil fuels from the current energy generation mix. The country's wind power potential is not negligible. Therefore, proper studies are essential on exploring potential zones, project implementation obstructions, and practical grid expansion planning programs. Besides, resolving unstable power supply issues, segregation of the transmission and loading dispatch functions are vital as the segregation process reduces management complexities and increases supply efficiency. Moreover, higher engagement of financial institutions in investing in renewable and advanced energy systems can be achieved through enhancing their understanding, creating dedicated funds for green projects, and mandating them to invest a specific part of their funds on those projects. Additionally, incorporating policies in the national plan for private companies who act as energy service companies (for installing, operating, and maintaining the system, customers pay periodically for availing services) are also needed. Finally, to align the competencies of the workers to the requirements, initiatives in skill enhancement programs are indispensable.

The transformation of Bangladesh from agro-based to industrial-based removes a significant portion of the male workforce from agriculture. Hence, modernizing agricultural practice and scaling up mechanization is essential. However, in both cases, the country needs to achieve economies of scale as land fragmentation limits the potential for a well-functioning agricultural land market. Besides, the land rental market in rural is informal, and leasing contracts are short-term in nature, which discourages rental farmers' medium-and long-term investments due to risk factors and constrains their ability to use rental land as collateral for financing. Therefore, further review of the agricultural land rental market in promoting greater formalization with longer rental tenures and research on appropriate machinery invention matches with smallholding purchasing ability is required. In addition to it, an aggregating model to promote economies of scale through policy emphasizing public-private partnerships is essential for reducing farmers' financial and logistics complexities and facilitating better connectivity with large buyers and off-takers. Subsequently, developing site-specific fertilizer and pesticides recommendation systems, promoting large-scale organic farming, and facilitating training to farmers on dynamic agricultural production systems, including space utilization and crop diversification methods are essential for the sustainability of this sector. Also, for domestic consumers, product standards need to be tailored to domestic market conditions while ensuring that value-chain actors comply. Furthermore, more robust changes in development formation need to occur along with various parts of the value chain. These include female farmer network development initiatives to increase storage facilities through cooperatives, establish 'toll-free' wholesale markets in government land, expand insurance

programs, train farmers in electronic trading services, facilitate credit for the lagging regions' farmers, and diverse food processing industries in rural.

For the vulnerabilities of climate exposure, it is imperative to develop a more concise, realistic, and results-driven management approach through adequate research. For vigorous initiatives, it is required to enhance disaster resilience infrastructure, disseminate knowledge on disaster management approaches, adopt climate-smart technology, research on drought-resistant seed production, and train on alternative livelihoods pathways. Besides, policy frameworks must consider how individual households in rural areas face vulnerability with time, depending on their physical, social, financial, and human capital. Also, launching different agricultural crop insurance programs and facilitating incentives for organic farmers will encourage them to become part of more holistic farming approaches, which is needed to balance profitability, cost-effectiveness, and ecology. In addition, implementing various rainwater harvesting tactics, setting up the desalinization plants at the community level, and adopting renewable energy and eco-friendly construction materials can reduce the adverse impact of climate change.

Ensuring sustainability in health, water, and sanitation in rural Bangladesh urges focusing on demand-side budgeting and formulating priority and realistic-based regulation with proper management authority that matches the households and local stakeholder preferences. Moreover, enhancing existing and new facilities' efficiency demands appropriate technological support, recruitment of skilled professionals, and the correct monitoring bodies. Creative out-of-the-box solutions are necessary to mitigate fund allocation complexities for development purposes. Thus, a central relief fund for treasuring corporate social responsibility money, Zakat, and sin tax money can play a handy role. As more human resource is engaged in the production capacity, it is essential to keep them healthy for fulfilling the aforementioned objectives. Thus, attracting qualified healthcare professionals in distant remote locations necessitates the foundation of equal urban incentives and social recognition. These measures are crucial as they are coupled with improved monitoring, evaluation, and anonymous feedback reporting mechanisms to track and check actors responsible for influencing doctors to prescribe unnecessary medication. Equally applicable is instituting vocational-based nursing and medical instruments operation and maintenance courses in rural areas to resolve the current shortage of technicians and nurses and keep the health welfare moving towards optimal standards. In addition, adopting the public-private partnership approach in constructing piped water supply systems and expanding fecal sludge management will reduce water contamination issues in rural areas. Furthermore, carefully designed initiatives to identify the demand and existing gap of the required facilities and disseminate knowledge can be achieved through initiating programs that explicitly emphasize behavioral change theory and structural research led by trained and supervised community health workers.

To increase the rural institutional enrollment rates, financial assistance must reach the grassroots level. Hence, expanding student loan schemes and poverty-targeted scholarship and tuition support for the least financially capable families is essential. With them, external assistance and foreign aid strategy for educational development require acute matching of the stakeholders and their traditional development partners' interests, honoring SDG targets. To raise the higher education preparedness of secondary students, emphasis on reforming the curriculums and critical thinking on whether increasing higher school passing rates are overshadowing the quality or not is essential. Moreover, for the effectiveness of the tertiary curriculums, introducing interdisciplinary programs is necessary to help the students to equip with the necessary skills and knowledge that matches the job market. Besides, attracting highly qualified teachers, adjusting their wage parameters, and improving their competency through professional development programs are essential for fostering educational development and student success. In addition, the compulsory publication for tertiary level teachers and students and mandatory preservation and utilization of yearly research on policies and legislation for all the tertiary institutes, and purchasing access to databases fund will enhance the quality of the education. Finally, the open admissions policy that allows graduates from all education streams into commerce and arts programs will reduce the horizontal job-education mismatch, help to develop a wide range of specialized skills, create cluster-based jobs, and reduce youth unemployment problems.

Achieving gender equality and women's empowerment in rural areas necessitates ensuring primary education and providing opportunities for higher education. Expanding the scope of technical and vocational education and training can enhance the low labor productivity issue and reduce the dispersion between in-demand skills in the job market and skills attained through formal education. Similarly, entrepreneurship enhancement urges upscaling of markets and value chain systems while increasing the availability of credit. Hence, initiatives to strengthen the value chain, reduce credit availing complexities, and facilitate credit at a concessionary rate will largely contribute to their development. Along with the initiatives, women's control over assets can be enhanced through engaging religious leaders in disseminating knowledge of women's inheritance rights among the mass, facilitating discounting land registration fees, easing procedural barriers, and strengthening existing laws and policies to reflect more equitable life solutions. Similarly, to solve child marriage issues and fight against violence, initiatives need to be taken to minimize the misalignment between societal and state goals, build clear consensus over its importance, implement stricter anti-child marriage and anti-harassment laws, and expand welfare schemes. The introduction of a central database system linked to the labor ministry and

local government bodies to provide the necessary data that is relevant jobs for women trained in different institutions is not a special request but rather a formal practical and standard modus operandi.

Finally, for digital exposure across rural communities, policies to promote digital skills need to be guided by equity policies apart from government initiatives in strengthening infrastructure and network coverage by adapting to different contexts and actors to avoid the severity of social exclusion. Understanding the needs for different age groups' connectivity demands will help to deliver trustworthy content and services through corrective monitoring and implementation of content. Incorporating ICT in the primary and secondary curriculum and ensuring adequate devices availability with stable connectivity will move the development process forward for recent and future generations. Subsequently, impact assessments of ongoing projects and emphasizing scientific research are essential to scale up the adoption process and design new or altering policies and initiatives. Besides, increasing the digital literacy rate requires government, non-government and other organizations to work together to incentivize the production of technological digital resources for small rural producers and train rural masses by formulating peer groups (containing males and females of different age groups) to access the needed information and understand the nuances of e-commerce. These institutions need to change the thought about computer literacy from a luxury of development to a life's fundamental need, such as water and clean air.

**Limitation:** The limitations of this study include relying only on two databases and the unavailability of updated data.

**Author Contributions:** conceptualization, F.A. Sunny and H. Zuhui; methodology, F.A. Sunny; validation, H. Zuhui; investigation, F.A. Sunny and T.T.P. Karimanzira; resources, F.A. Sunny, T.T.P. Karimanzira and L.L. Fu; writing—original draft preparation, F.A. Sunny; writing—review and editing, F.A. Sunny and T.T.P. Karimanzira; supervision, F.A. Sunny and H. Zuhui.

**Funding:** This article received no funding.

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

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