

The Padma Multipurpose Bridge: A Link towards a Prosperous Future through Connectivity and Mobility

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ABSTRACT

This study describes the impact of the Padma Multipurpose Bridge in creating regional connectivity and mobility in traffic movement, thus contributing to the socioeconomic development of Bangladesh. It finds that the travel time between the Dhaka division and the southwestern region will be saved by about two hours for cars and buses and by over 10 hours for trucks due to new connectivity through the bridge. It will reduce the distance from Mongla Port to Dhaka by more than 100 km to 170 km and save a lot of working hours, which will further accelerate the growth of the country's economy. Additionally, a total of 212.05 km of the new railway line is being constructed for the Padma Multipurpose Bridge, which will connect Dhaka with the country's largest land port, Jessore. After the Padma Bridge Rail Link project is done, the travel time from Dhaka to Kolkata via Jessore will be cut in half, and it will take only 3 to 4 hours. Moreover, the bridge will also pave the way for putting in place a new route for the Trans-Asian Railway network. The Padma Multipurpose Bridge is estimated to boost the country's annual GDP by 1.23 percent and the southwestern region's GDP by 2.5 percent. Moreover, the Padma Multipurpose Bridge will reduce the poverty rate by 1.01 percent at the regional level and by 0.84 percent at the national level. This study finds that to take full advantage of the newly constructed bridge, the southern part of the outer ring road of Dhaka proposed in RSTP should be completed soon. Padma Multipurpose Bridge will work as a key component of Asian Highway-1, boosting economic growth in Asia and improving the country's standing on the continent.

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1. INTRODUCTION

Bangladesh is a riverine country. According to Bangladesh Water Development Board (BWDB, 2022), about 230 rivers currently flow in Bangladesh (during summer and winter). Among them, Brahmaputra is the longest river and Padma is the swiftest whereas Jamuna is the widest river. These three rivers divided the land area of Bangladesh into three parts and created great barriers for movement of people and commodities among the regions. Construction of Bangabandhu bridge on the river Jamuna linked the north-western part of the country with the eastern part where the capital and the main seaport are located. The Hardinge bridge and Lalon Shah bridge established road and rail communication between north-western and south-western regions of the country. However, there was no direct road or rail connection for easy communication

between eastern and south-western parts of country and the people of Bangladesh had a dream of having a bridge on the fiercely flowing Padma River. Hence, the Padma Multipurpose Bridge has been a dream project for millions of people in the southwestern region of Bangladesh. This bridge has made a connection of Louhajong, Munshiganj to Shariatpur, and Madaripur, linking the southwest of the country, to the northern and eastern regions.

The Pre-feasibility Study of the Padma Multipurpose Bridge Project was done from 1996 to 1999. Bangladesh Bridge Authority and a Japanese company named JICA finalized the study between 2003 and 2005. Later, between 2009 and 2011, the US, New Zealand, and Australia-based consultant organization Maunsell-Aecom concluded the design of the Padma Multipurpose Bridge. However, when there was a crisis over the bridge's funding, the

Bangladesh government announced the construction of the Padma bridge with its own fund in 2013. In 2014, a deal to construct the main bridge was struck with China Major Bridge Engineering Co. Ltd., and Sinohydro Corporation Limited got the contract for river training work. The construction began in December of that year. About six (6.15) km long structure of the main bridge was being erected on 42 pillars with the help of 41 spans, spanning 150 meters that are expected to withstand earthquakes of magnitude nine on the Richter scale. Moreover, it has the deepest piling in the world at 128 meters, is the 122nd longest bridge in the world, with piles that are 3 meters in diameter. Besides the four-lane road link at the top and a single line rail link at the bottom, the bridge will also take gas, electricity, and broadband internet through fiber optical cable to the country's south-west. The bridge's total length, including the main bridge and viaduct, is more than 9 kilometers. Moreover, it is the largest multipurpose road-rail bridge and the first fixed river crossing for road traffic across the Padma River.

Initially, the Padma Bridge megaproject cost was estimated at BDT 10,161 crore in 2006 and BDT 20,506 crore in 2011, which later increased to BDT 30,793 crore (Business Inspection, 2022). Although several mega projects, like the Rooppur Nuclear Power Plant, are financially much larger than the Padma Multipurpose Bridge project, however the socio-economic, historical, and geopolitical significance of the Padma is far greater than others. The Padma Multipurpose Bridge is no longer simply a steel structure; it has become the focal point of Bangladesh's ability, economic prosperity, and the emotions of the Bangladeshi people. The bridge was finally ceremonially inaugurated for road traffic by the Honorable Prime Minister on 25th June 2022.

2. SCENARIO OF CONNECTIVITY BEFORE THE PADMA BRIDGE

The southwest region is characterized by vast inland waterways utilizing many rivers and their tributaries. Prior to the opening of the bridge, there was no direct links by roads and passenger transport between Dhaka and the southwest districts were cut off from the country's major economic centre, the Dhaka-Chattogram economic corridor as shown in Figure 1. Moreover, the southwest region the only available rail connection of these southwest districts with Dhaka city is through Jamuna Bridge and Hardinge Bridge which takes approximately 10-12 hours.

Consequently, the southwest region relied heavily on inland waterways. There are 48 ghats in Barisal Port, 40 ghats in Khulna Port and 39 ghats in Patuakhali Port. Southwest region was connected to Dhaka city by two ghat namely Mawa-Kathabaria and Paturia-Goalundo. The Paturia site uses 22 ferries over 24 hours at 5 ghats while the Goalundo site has 3 ghats. The average time of crossing is approximately 40 minutes in the high-water level season and 30 minutes in the low-water level season. However, Mawa-Kathabaria site utilizes 11 ferries at 4 ghats over 24 hours. The average number of round trips per day for each ferry is 4, and the average crossing time is 2

hours 5 minutes in the high-water level season and 2 hours in the low-water level season.



Figure 1: Connectivity link missing between Southwestern side and Dhaka before the construction of Padma bridge. (Source: Railway Gazette International)

Approximately 62,500 passengers cross directly from the north-east Dhaka region to the south-west each day at the combined Mawa and Goalundo crossing points. In terms of vehicle numbers, 2,909 vehicles cross Padma River per day, comprising 1295 trucks (44%), 700 light vehicles (24%), and 914 car (32%) (Feasibility study, 2005). As trucks cross the river by ferry, no loading/unloading of cargo takes place. Trucks tend to have long waiting times. This increases their travel time by hours or even days. It took at least 2 to 3 days for a freight truck to travel from Barisal or Khulna to Dhaka or from Dhaka to these areas. This form of transport was not only uncertain but was also time-consuming.

According to the Asian Development Bank (ADB), 27% of the total population of Bangladesh lives in the south-west (Mustafizur Rahman, 2022). Due to poor connectivity, economic operations in the southwestern zone have not been too easy. Consequently, the districts did not seize much industrialization. As a result, poverty and under-employment constitute major problems in the region.

3. EXPECTED TRANSPORTATION BENEFITS

Padma Multipurpose Bridge will offer many advantages to the region. It connects the isolated 21 southwestern districts as well as the port of Mongla and the port of Payra, respectively the second and third-largest ports in the country, with the capital. According to Zahid Hossain, lead economist at the World Bank, with the opening of road and rail traffic to the Padma Bridge, people in the country's south-west will begin to benefit from the bridge immediately (Mustafizur Rahman, 2022). The following sections describe the transportation benefits of the bridge.

A. Roadway

According to ADB, the Padma Multipurpose Bridge will carry an average of 24,000 vehicles per day in 2024 and 67,000 by 2050. It is expected that the travel time between the Dhaka division and the southwestern region (SWR) will be saved by about two hours for cars and buses and

over 10 hours for trucks. Moreover, according to ADB, the long-term (31 years) road user benefit of the Padma Bridge in the traffic model stood at 18.512 billion dollars, and according to the Social Accounting Matrix (SAM), the total project benefit was estimated at \$25 billion (24.993) at the same time.

B. Railway

A total of 212.05 km of the new railway line is being constructed for the Padma Multipurpose Bridge with the sponsorship of the Bangladesh Railway Ministry, which will connect Dhaka with the country’s largest land port, Jessore shown in Figure 2. The Chinese government will provide 85 percent of the financing of the 40,000-crore project through China Exim Bank, and the Bangladesh government will provide the rest.

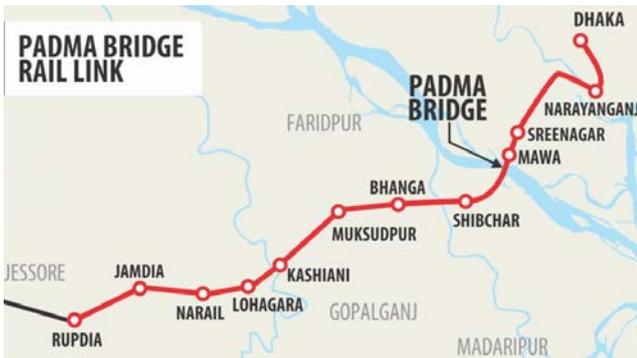


Figure 2: Padma bridge rail link (Source: The Daily Gonokantho)

After the Padma Bridge Rail Link project is done, the travel time from Dhaka to Kolkata via Jessore will be cut in half, and it will take only 3 to 4 hours which will boost the country’s foreign trade. By doing so, Bangladesh will be able to maintain a railway network with Bhutan, Nepal, and India.

C. Waterway

As mentioned in the previous section, the southwest region is characterized by vast inland waterways utilizing many rivers and their tributaries. Considering the importance of navigation on the Padma River throughout the year, a vertical navigation clearance of 18.3m is maintained above high flood level for free movement of all types of vessels using the river. However, the vehicle crossing by ferry is reduced after the opening of the Padma bridge.

4. EXPECTED ECONOMIC BENEFITS

The total production of the transport, trade, and local industrialization focused on the Padma Bridge, as well as GDP growth, will influence the country’s entire economy. The Padma Multipurpose Bridge is estimated to boost the country’s annual GDP by 1.23 percent. Similarly, the southwestern region’s GDP is projected to increase by 2.5 percent as shown in Figure 3. Additionally, the bridge will be linked to the Padma Rail Link Project, which is expected to turn Bangladesh into a sub-route of the trans-Asian rail network and accelerate GDP growth by approximately 1 percent.

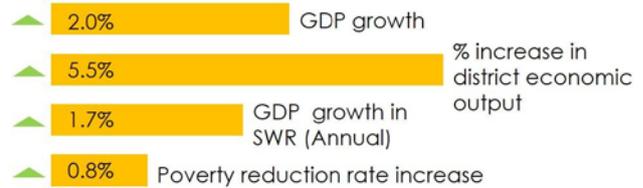


Figure 3: Economic Improvement of regional and national level after Padma Bridge construction (Source: Light Castle Partners)

Moreover, new industrial units will be established, creating many job possibilities. All the southwestern districts will be covered in these areas. There will be increased hiring, re-skilling, or up-skilling of the labor force in accordance with industry needs, and maybe a hike in the minimum wage as the demand for labor rises. Hence, more economic opportunities will ultimately improve living conditions and thus reduce poverty. The following sections describe the economic impacts of Padma Bridge.

A. Effect on the economy

The bridge’s development will have a significant economic effect on the country. In 2010, Aecom-Maunsell, reported that the bridge’s Reward Ratio (BCR) was 1.6% and the Economic Rate of Return (ERR) was 18%. The BCR will be 2.1 and the ERR will be 22%.

In addition to the design experts, the World Bank’s independent consultants and the Bridges Team’s consulting firm assessed the bridge’s economic effect and found that the bridge’s building will be financially profitable. In addition, economic activity in the south-west has already increased around the bridge, with mass-level industrialization underway. In this context, the rate of land sale in Barisal is doubled in 2022 compared to 2021. Lands near highways are also being sold at three-four times higher prices than before. So, there will be rapid growth of mega factories, hospitals, universities, housing industries, and small businesses around the Padma Bridge.

B. Trade and commerce

The direct connection to the capital will aid in the expansion of trade and commerce, as well as the supply of raw materials and industrialization. Moreover, the bridge will reduce the freight transportation time to a maximum of one day, which increases the trading of the regions by several times. According to a report by the Khulna Chamber of Commerce, the region will play a groundbreaking role in regional connectivity in South Asia and connect Dhaka with Mongla and Payra ports once the bridge is launched. The bridge will reduce the distance from Mongla Port to Dhaka by more than 100 km to 170 km, whereas the current distance between Chittagong Port and Dhaka is about 264 km. As a result, the distance between Dhaka’s Mongla seaport and Chittagong port will be reduced. Increasing the importance of the Mongla port in the transportation of goods and facilitating communication between Dhaka and the south will save a lot of working hours, which will further accelerate the growth of the country’s economy.

At present, more than 90 percent of the country's international trade is done through the Chittagong Port. In 2021, the trade volume of this port was about 90 billion dollars. Initially, the port of Chittagong could handle 2 million TEU (Twenty-Foot Equivalent Unit) containers per year, but in 2021 it increased to more than 3.2 million TEU. Increased cargo movement between Dhaka and the Mongla Port will reduce congestion in the port of Chattogram. Until December 2021, less than 20 (19,224) thousand containers were handled from Mongla, which is even less in the case of Payra port. In addition, after the launch of the bridge, besides easy commute, it will also reduce the cost of gas, electricity, and internet services, which will expand the existing trade in the region.

C. Regional industrial revolution

Experts estimate an industrial revolution in 21 districts in the southwest, especially within a year of the double-decker bridge's launch. Moreover, the bridge will significantly improve the economy of the country's south-west region, an evident proof of which is the Bangabandhu Bridge, around which an industrial revolution has taken place in North Bengal. The changes in the economy of North Bengal because of this bridge have contributed about 2% to the GDP growth of Bangladesh. Such contribution has also been estimated in the case of Padma Multipurpose Bridge. According to many experts, the contribution will be more than the Jamuna. Experts believe that many small and big industries will be growing in the south-western part of the country along the bridge route, including manufacturing businesses, RMG, assembling plants, storage facilities. According to ADB estimates, the direct investment made around this bridge will boost the regional economy. According to JICA estimates, a 10 percent reduction in travel time from Dhaka would increase the district economy to 5.5 percent, which would increase the region's annual GDP growth by 1.7 percent. Furthermore, after the bridge is completed, it will cut the cost of gasoline, power, and online services, thereby expanding the region's current trade.

Additionally, the shipbreaking industry, RMG, assembling plant, and storage facilities will be set up in this region. According to a BSIC source, 500 to 1000 factories of the different sectors will be set up in 6 districts of the Barisal division in the next ten years. According to a report by Dhaka Tribune, if demand for gas, electricity, internet, and infrastructure in the south-west can be met, trade between India, Nepal, and Bhutan with Bangladesh through the region will increase. As a result, the economic landscape of the south-west may change. The Bangladesh Economic Zones Authority (BEZA) is developing 17 economic zones in the region to accelerate industrialization and economic growth.

D. GDP Growth

The road distance between Dhaka and most of the south-western districts will be reduced to at least 100 km. In addition to reducing the time and cost of transporting passengers and goods, vehicle maintenance and fuel costs will be much lower. As a result, people from all sectors, including business and agriculture, will be benefited, impacting the country's GDP.

Moreover, the economic output of the transportation, trading, and regional industrial revolution centered on the Padma Multipurpose Bridge, along with the GDP growth, will impact the overall economy of the country. According to a Dhaka Tribune report, the bridge is expected to contribute about 1.3 to 2 percent per annum to the country's GDP. At the same time, with the completion of the Padma Bridge Rail Link project, GDP will grow by another 1 percent. According to the current base year, a BRAC study estimates a 5 percent contribution to GDP in 31 years (Rahman, A. and Khondker, B.H., 2016). However, once the bridge is fully completed, it will contribute 1.2 percent to the country's GDP. According to the IMF forecast, Bangladesh ranks 20th in the world in ranking GDP growth in 2022. In 2026, Bangladesh will reach the 3rd position in this ranking, one of the contributors of which will be this bridge.

E. Tourism

The tourism sector will thrive, and domestic and international tourists will flock to new and old tourist spots such as Kuakata beach in the southern area, the Sundarbans, Bangabandhu Mazar in Tungipara, and old and new resorts at Mawa and Jazira.

5. EXPECTED SOCIO-ECONOMIC BENEFITS

According to a CPD source, the poverty rate in the Khulna-Barisal region is at least 10 percent higher than the national average (Mustafizur Rahman, 2022). The construction of the Padma Multipurpose Bridge will reduce the poverty rate by 1.01 percent at the regional level and by 0.84 percent at the national level as shown in Figure 3. Agriculture will be significantly improve. Farmers will be benefited from higher commodities prices. Farmers in these areas are not getting a fair price for their crops due to expensive and time-consuming transportation systems. Once the bridge is completed, jute and fish from Khulna division of Faridpur, along with agricultural products from Barisal, can be transported in the country and abroad quickly. As a result, farmers and producers get better prices for their products, which increase their quality of life.

As a result of communication, transportation, agriculture, industrialization, and employment progress, the living standards of the people of this region will be improved. The country's real estate sector in the south-west has also boosted around the Padma Bridge. As a result, it is expected that in the future people in this region will have access to gas, electricity and internet services at a lower cost than before. With the availability of broadband internet facilities, digitalization will be easier in these areas. There is a possibility of creating more jobs through freelancing, which will help to enhance the socio-economic status of the people of the region. Being financially prosperous the education system will be improved of the area as well as increase the cultural integration among the people on both sides of the Padma. According to a TBS source, employers will increase by about 1 million within the upcoming five years of the bridge's opening, reaching 30 to 40 million in the next ten years. In addition, at the regional level, the government has taken several steps to

create a skilled workforce. In addition to this, for a long time, the people of this region were almost deprived of the advanced medical services of Dhaka due to the poor transportation system. After the construction of the Padma Bridge and the development of communication systems, people from this region can travel to Dhaka and receive advanced medical care quickly.

6. FUTURE CHALLENGES & OPPORTUNITY

The Padma Multipurpose Bridge is a dream bridge which will not only establish the long-awaited direct road and rail communications between the capital and south-western parts of Bangladesh but also contribute to greater connectivity and trade among Asian countries. The following sections describe the future opportunities of the national and international connectivity.

A. Improvement of backward and forward linkage

The forward link of the Padma Multipurpose Bridge is achieved by the Bhanga Expressway. However, the backward link is still not properly achieved. However, there is a scope of achieving the full efficiency of this bridge once the backward link is well established. In the RSTP (2015), three kinds of ring roads were proposed for Dhaka City. The alignment of inner ring road is along the Balu River and the Buriganga River, located inside current urban area, while the alignment of middle ring road shares with the Dhaka Bypass Road and the outer ring road is a newly proposed alignment which falls along the boundary of RAJUK area shown in Figure 4 while Table 1 shows the construction status of these three ring roads.

Table 1
Construction status of the ring roads

	Inner Ring Road	Middle Ring Road	Outer Ring Road
Completed	4.0 (5.5%)	0.0 (0.0%)	0.0 (0.0%)
Widening/Improvement	38.2 (52.2%)	59.9 (55.5%)	0.0 (0.0%)
New Road	31.0 (42.3%)	48.1 (44.5%)	129.0 (100.0%)
Total	73.2 (100.0%)	108.0 (100.0%)	129.0 (100.0%)

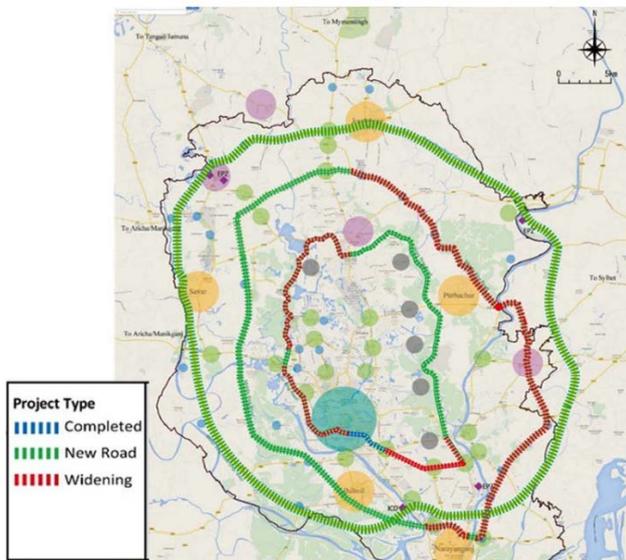


Figure 4: Current construction status of the three ring roads (Source: JICA Study Team)

Middle road is total 108.0 km whereas outer ring road is 129.0 km. The location of middle road passes through as shown in Figure 5, specifically, Autpara, Dhaka bypass, Bhulta, Kanchpur, Narayanganj, Jhilmil and Western bypass.

On the other hand, the outer ring road passes through Hemayetpur, Kalakandi, Madanpur, Danga, Bypail, Gazipur (RSTP, 2015). Southern part of the outer ring road, which is shown in Figure 6, is considered as high priority project to connect with Padma Multipurpose Bridge. It will connect Louhajong, Munshiganj to

Shariatpur and Madaripur, linking the south-west of the country to northern and eastern regions. Huge number of vehicles from Padma Multipurpose Bridge will flow from southern-west side to Jatrabari area which is also known for congestion prone area. So, to mitigate the congestion and get full advantage of the newly constructed bridge, the southern part of the outer ring road should be completed soon.

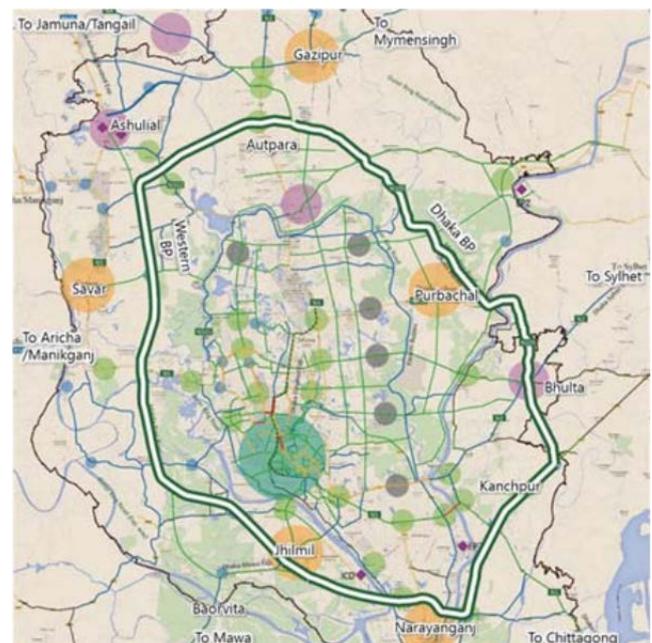


Figure 5: The location of middle ring road (Source: JICA Study Team)

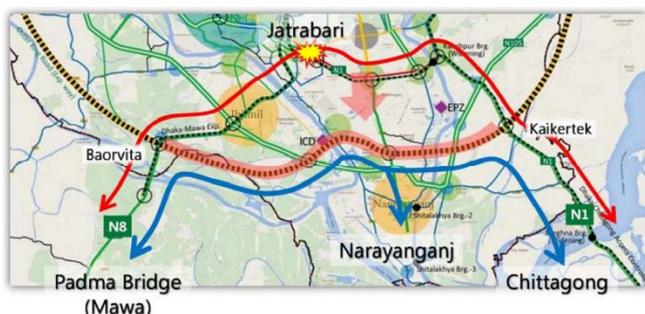


Figure 6: The high priority projects
(Source: JICA Study Team)

B. Establishment of international connectivity

In August 2009, Bangladesh joined the network conceived by the United Nations with a view to setting up regional connectivity among Asian countries via a highway system of over 145,000km roads passing through 32 countries. Bangladesh is connected to three Asian Highway routes named AH-1, AH-2, and AH-41 with a total length of 1,771km (Figure 7).

The route of AH-1 is Guwahati in Assam-Tamabil-Sylhet-Shaistaganj-Narsingdi-Kanchpur-Dhaka-Mawa-harjanajat-Bhanga-Bhatiapara-Kalna Ferry Ghat-Narail-Jashore-Benapole-Petrapole in West Bengal. Its length is 492km. It had two missing links: one is the Padma Bridge and another Kalna Bridge in Narail. One of the two, the 690m bridge construction in Kalna was comparatively easier, but the 6.150km bridge over the mighty Padma was always a massive task in terms of the magnitude of the work. With the opening of Padma Bridge and Kalna Bridge, these two missing links has disappeared. Padma Multipurpose Bridge will now work as a key component of the Asian Highway-1, boosting economic growth of Asia and improving the country's standing in the continent.

Moreover, the most portion of the AH-1 route is two-lane and it has four-lane stretches in urban areas and marketplaces. The RHD is implementing two projects involving Tk 20,500 crore to turn Kanchpur-Sylhet and Sylhet-Tamabil portions into four-lane keeping two additional lanes for slow-moving vehicles. Of the route, the portion from Kanchpur to Dhaka is now an eight-lane highway and Dhaka-Mawa-Bhanga a four-lane expressway. The RHD is going to take up a project to turn the 135km road from Bhanga to Benapole via Kalna, Narail and Jashore into a four-lane highway with Indian lines of credit. Meanwhile, the department has completed construction of the 690m bridge over the Madhumati River at Kalna point with a cost of Tk 959 crore. Once all the projects are completed, the entire AH-1 route would be elevated to either primary access-controlled motorway or Class-I (four or more lanes) highway.

Moreover, the bridge will also pave the way for putting in place a new route for the Trans-Asian Railway (TAR) network, another UN initiative aimed at creating an integrated railway network across Asia. It would be the fourth and the shortest TAR route, which would link India and Myanmar via the country and ultimately become a part of a network comprising 125,500km of railway lines

serving 28 countries. The TAR network is aimed at enhancing the efficiency and development of the railway infrastructure in Asia, according to the UNESCAP website. At the beginning, three routes of TAR had passed through Bangladesh. The route of TAR-1 is Gede in West Bengal-Darshana-Ishwardi-Bangabandhu Bridge-Joydevepur-Tongi-Akhaura-Chattogram-Cox's Bazar-Ghundhum-Myanmar. It has two sub-routes -- Tongi-Dhaka and Akhaura-Kulaura-Shahbazpur-Mahisasan of India. The route of TAR-2 runs through Singabad in West Bengal-Rohanpur-Abdulpur-Ishwardi to meet TAR-1. The route of TAR-3 runs through Radhikapur in West Bengal-Birol-Dinajpur-Parbatipur-Abdulpur to meet TAR-1.

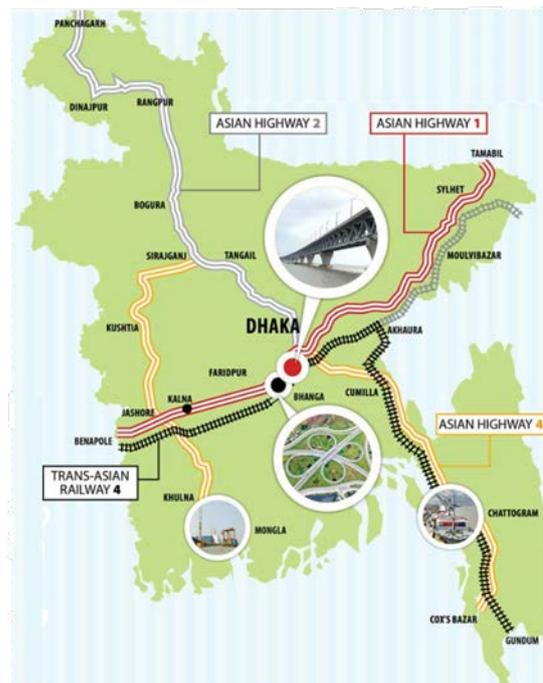


Figure 7: Asian highway and TAR project
(Source: The Daily Star)

With the building of a double-decker bridge roadway on the top and railway on the bottom over the Padma River, the country enters a new era of railway connectivity. Following Bangladesh Railway's request, UNESCAP agreed to incorporate Dhaka-Bhanga-Jashore track as a fourth route of the TAR network in Bangladesh (Figure 7). The route would run through Petrapole-Benapole-Jashore-Narail-Bhanga-Mawa-Narayanganj-Dhaka-Tongi before meeting TAR-1. However, Bangladesh Railway has to do a lot of things, including gauge conversions, to establish effective connectivity with TAR.

7. CONCLUSIONS

Padma Bridge is strategically located on the Asian Highway route AH-1 and Trans-Asian Railway Route. In the country context, it will provide a vital link in the transport network of Bangladesh by connecting Mongla sea port and Benapole land port in southwestern region with eastern region of the country and Chittagong Sea port. Padma Bridge will significantly boost economic and social uplift of the country, especially in the south-western part and function as a catalyst for poverty reduction. The construction of Padma Multipurpose Bridge will increase

national GDP by 1.23 percent and southwest regional GDP by 2.30 percent and reduce poverty by 0.84 percent. The construction of Padma Bridge has added a new dimension in construction industry by establishing records in the use of high-capacity technologies exceeding the existing limits and developing innovative technologies. Bangladesh is proud to show its ability to construct the largest and most difficult project using its own professional and financial resources. The travel time for southwestern bound traffic from capital city will be reduced 2-3 times than before. But Jatrabari is currently famous for the traffic congestion and after the opening of Padma Bridge, traffic situation is come to worst. Therefore, southern part of the middle or outer ring road should be constructed as soon as possible to achieve the full capacity of Padma Multipurpose Bridge.

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