

Analysis of Vessel
Traffic at Farakka
Lock Gate:
FY 18-19 &
FY 19-20

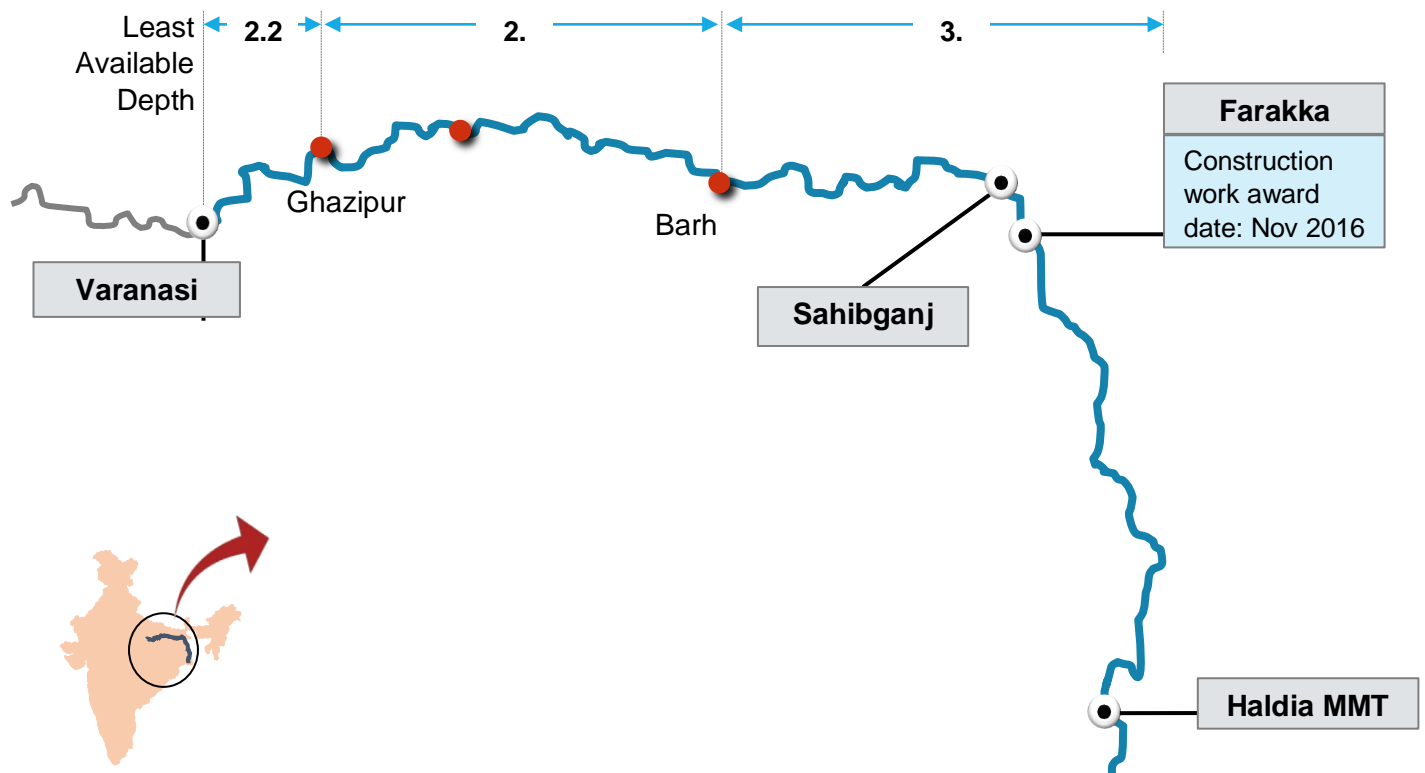
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Farakka Lock Gate - Background

Farakka Lock Gate is located across the Ganges river in Murshidabad district in the Indian state of West Bengal, roughly 16.5 kilometers (10.3 mi) from the border with Bangladesh. This lock gate is crucial for the passage of goods and passenger vessels along the National Waterway-1 as it connects the important sections of Varanasi-Sahibganj and Kolkata-Haldia. The project construction commenced in 1961 and the project was commissioned and dedicated to the Nation in May 1975. The lock gate was subsequently transferred to IWAI (MoS) in April 2018.

Figure 1- Overview of the National Waterway-1



Traffic at Farakka Lock Gate – National Waterway-1

A total of 238 vessels crossed the Farakka lock gate in 2018-2019. Of these vessels, 128 vessels travelled upstream, and 110 vessels travelled downstream. In the current financial year 2019-2020, 168 vessels have crossed the lock gate from April'19 to December'19, depicting a 30% increase over the same period last year. Both the upstream traffic of 90 vessels and the downstream traffic of 78 vessels has shown a 30% increase compared to the same period last year.

Table 1- Comparison of Total Vessel Traffic in FY19 & FY20

All Vessels	Apr'18 to Dec'18	FY 2018-19	Apr'19 to Dec'19
To U/S	94	128	90
To D/S	82	110	78
Total	176	238	168

Table 2- Comparison of Cargo Vessel Traffic in FY19 & FY20

Cargo Vessel	Apr'18 to Dec'18	FY 2018-19	Apr'19 to Dec'19
To U/S	16	33	18
To D/S	18	32	15
Total	34	65	33

Table 3-Comparison of River Cruise Traffic in FY19 & FY20

River Cruise Vessel	Apr'18 to Dec'18	FY 2018-19	Apr'19 to Dec'19
To U/S	5	6	4
To D/S	4	5	3
Total	9	11	7

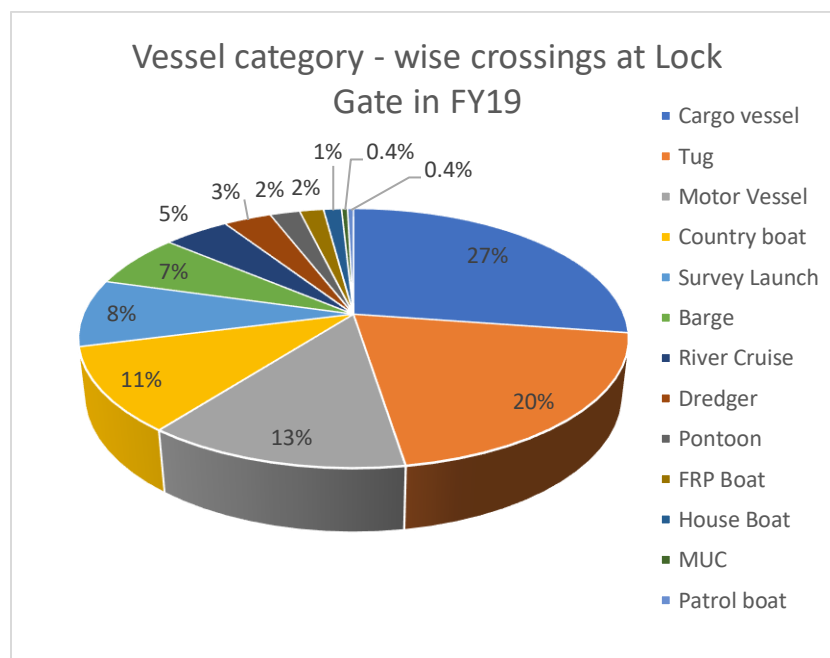
In terms of the cargo vessel movement, 65 cargo vessels crossed the lock gate in 2018-2019, of which there was an almost equal distribution of upstream and downstream traffic of 33 and 32 vessels respectively. In April-December period in FY 2019-2020, 33 cargo vessels crossed the lock gate, of which 18 vessels travelled upstream and 15 vessels travelled downstream. This traffic was almost constant as compared to the traffic in 2018-2019 for the same period. In terms of the river cruise vessels, 11 cruise vessels crossed the lock gate in 2018-2019, of which 6 vessels travelled upstream and 5 vessels traveled downstream. In April-December period in FY 2019-2020, 7 river cruise vessels crossed the lock gate, a decrease of 2 vessels as compared to the traffic in the past year for the same period.

Profile of Vessels crossing the Lock Gate: 2018-2019

The below pie chart shows the category wise breakup of those vessels. A total of 11 categories of vessels crossed the lock gate in 2018-2019. The top 4 categories of vessels account for 71% of the vessel crossing during the year. Amongst the top 4 categories, cargo vessels account for the highest percentage of vessel crossings-27%, followed by tugs 20%, Motor vessels-13% and country boats-11%.

Survey Launch vessels and barges make up for 8% and 7% of the traffic respectively. River cruise vessels contributed to 5% of the total traffic. The remaining 6 categories account for less than 10% of the total traffic.

Table 4- Vessel Category wise crossing in FY19



Vessel category	Total vessels
Cargo vessel	65
Tug	48
Motor Vessel	31
Country boat	25
Survey Launch	20
Barge	16
River Cruise	11
Dredger	8
Pontoon	5
FRP Boat	4
Houseboat	3
MUC	1
Patrol boat	1
Grand Total	238

Figure 2 Vessel category wise crossing (%) in FY19

Of the 238 vessels which crossed the lock gate in 2018-2019, 65 were cargo vessels and 11 were river cruise vessels which together constituted 32% of the entire vessel traffic.

In terms of the monthly traffic, the graph given below shows the monthly trend of total vessels travelling across the lock gate as compared to the cargo vessels and river cruise vessels. In October, November and December months of FY 18-19, lock gate saw increased level of traffic of overall vessels; Cargo vessels crossings were at an increased level during December 2018, January 2019 and March 2019; Cruise vessel crossings were at peak in Oct-Nov period.

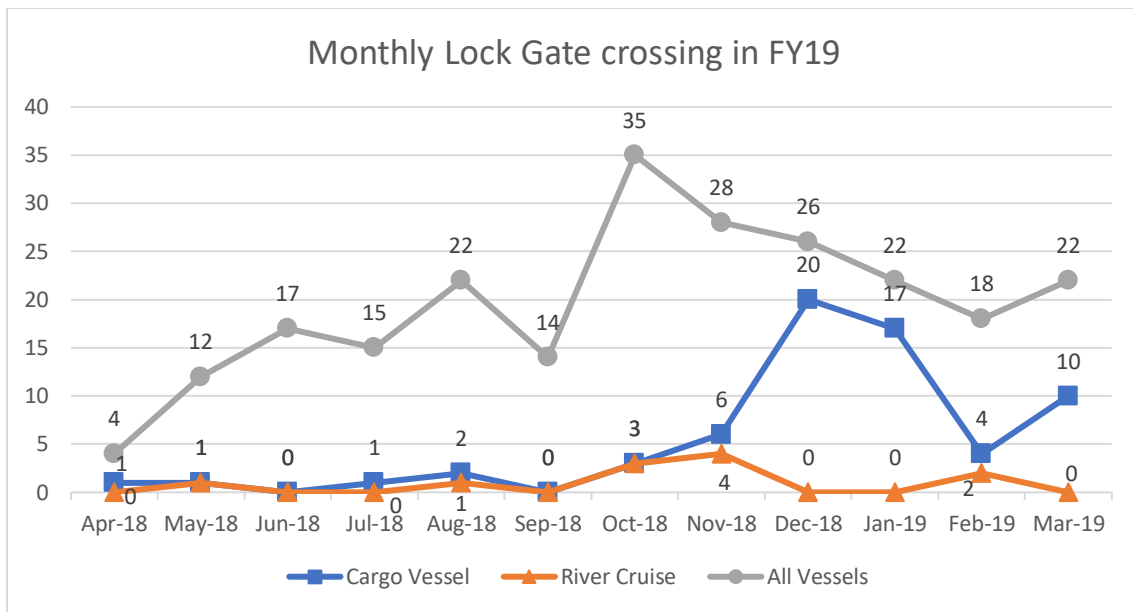


Figure 3- Month Wise Vessel crossing in FY-19

Table 5- Operator Wise Vessel crossings in FY19

Amongst the 65 cargo vessels which crossed the lock gate in year 2018-2019, there were 20 unique vessels. Of the 5 private operators to whom these cargo vessels belonged, M/s Rajesh Auto Merchandise operated the largest number of unique vessels (14 nos.), which were in the GRT range of 1,290-1,373. These vessels also had the highest number of lock gate crossings in the year (48 nos.). Amongst the 11 river cruise vessels which crossed the lock gate, 3 were unique vessels operated by different private operators. The highest number of lock gate crossings were made by the river cruise vessel owned by M/s Heritage River (8 nos.) having GRT of 951.

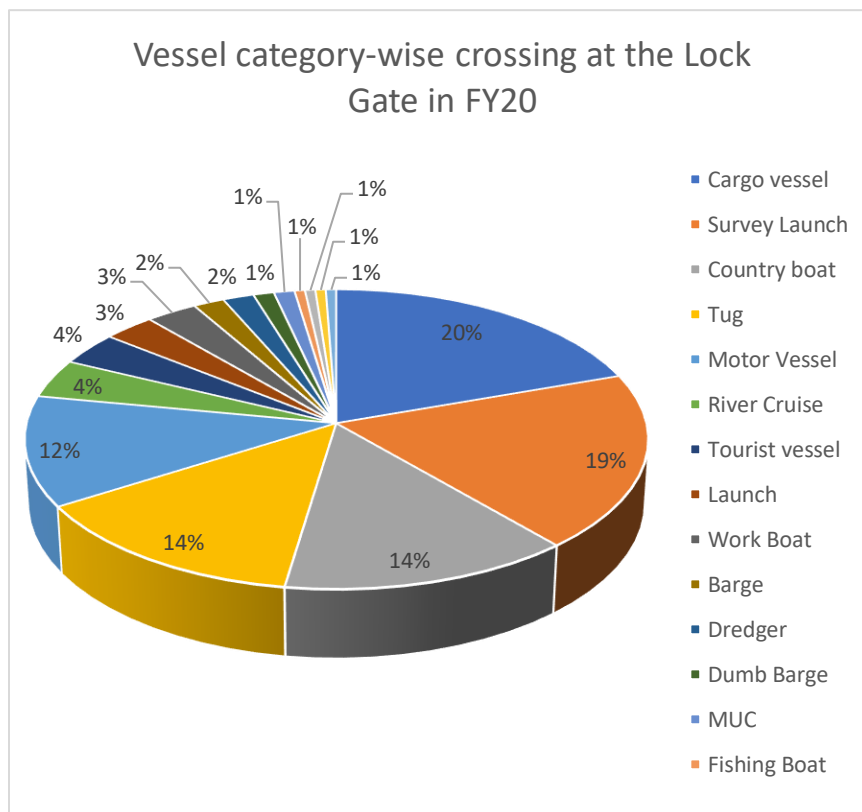
Vessel Operator	Type of Vessel	Unique Vessels	Lock gate crossings	GRT range
Haldia Nirman	Cargo	2	3	426-798
Krishna Shipping & Logistics	Cargo	3	5	650-1058
Rajesh Auto Merchandise	Cargo	14	48	1,290-1,373
Tirupati Vessels	Cargo	1	1	217
Ocean whale	Cargo	1	1	1,830
Total		20	58	
Heritage River	Cruise	1	8	951
Assam Bengal Navigation	Cruise	1	2	899
Nordic Cruise line	Cruise	1	1	67
Total		3	11	

Profile of vessels crossing the Lock Gate: 2019-2020 (Apr '19 to Dec '19)

The below pie chart shows the category wise breakup of vessels that crossed lock gate in period April-December 2019. A total of 17 categories of vessels (refer table placed below) crossed the lock gate in 2019-2020. The top 5 categories of vessels (Cargo vessel, Survey Launch, Country Boat, Tug, Motor Vessel) account for approx.70% of the vessel crossing during the year. Amongst the top 5 categories, cargo vessels account for the highest percentage of vessel crossings-20%, followed by Survey Launch-19%, Country Boat-14%, Tugs-14% and Motor vessels-12%.

River cruise vessels constituted 4% of the vessel traffic. The remaining 10 categories account for approx.16% of the total vessel traffic.

Table 6- Category Wise Vessel Crossing in FY20



Vessel	No of Gate Crossings
Cargo vessel	33
Survey Launch	32
Country boat	23
Tug	23
Motor Vessel	20
River Cruise	7
Tourist vessel	6
Launch	5
Work Boat	5
Barge	3
Dredger	3
Dumb Barge	2
MUC	2
Fishing Boat	1
Houseboat	1
Pontoon	1
Rafting Boat	1
Grand Total	168

Figure 4- Category Wise Vessel Crossing (%) in FY20

Of the 168 vessels which crossed the lock gate in 2019-2020, 33 were cargo vessels and 7 were river cruise vessels which together constituted 24% of the entire vessel traffic.

In terms of the monthly traffic, the graph given below shows the monthly trend of total vessels travelling across the lock gate as compared to the cargo vessels and river cruise vessels. In July, October,

November and December months of FY 19-20, lock gate saw the increased traffic of overall vessels; Cargo vessel traffic increased in May, July and October. Cruise vessel crossings were at peak in October.

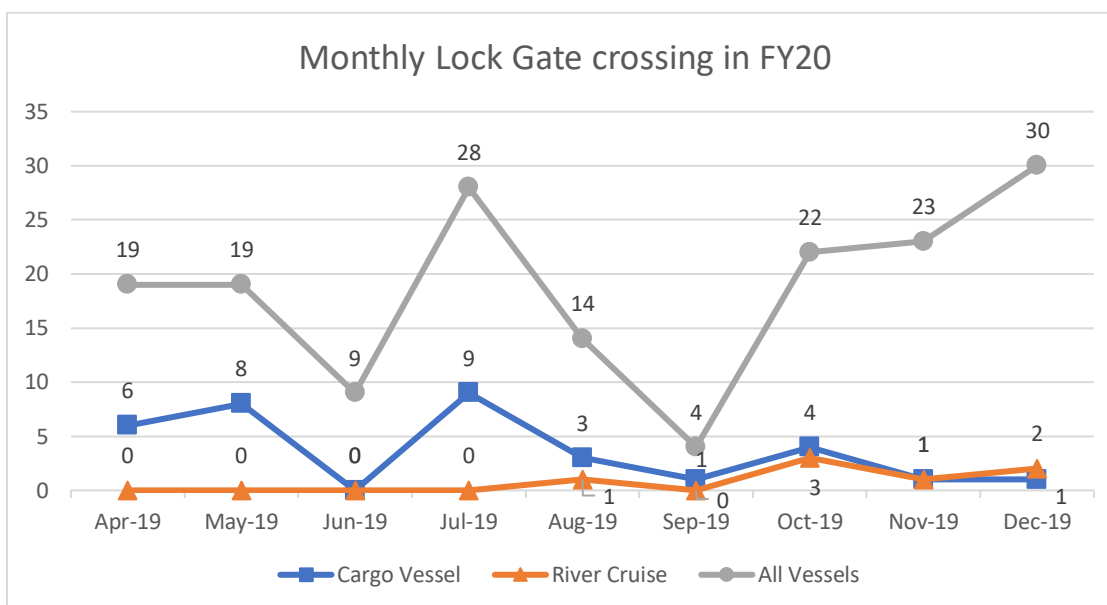


Figure 5- Month Wise Vessel Crossing in FY20

Amongst the 33 cargo vessels which crossed the lock gate, 24 were unique vessels. Of the 11 private operators which operated these cargo vessels, Eastern Navigation owned the largest number of unique vessels (5 nos.) which were in the GRT range of 207 to 517. Rajesh Auto Merchandise owned the second largest number of unique vessels (4 nos.) which were in the GRT range of 1,351 to 1,673. In terms of number of lock gate crossings, Rajesh Auto had the maximum vessel crossings (7 nos). Amongst the 7 river cruise vessels which crossed the lock gate, 2 were unique vessels belonging to different private operator. Vessel belonging to Assam Bengal Navigation with GRT of 899 made the highest number of lock gate crossings (6 nos.).

Vessel Operator	Type of Vessel	Unique Vessels	Lock Gate Crossing	GRT Range
Adani Logistics	Cargo	1	1	1,351
Asha Bharsha	Cargo	3	5	1,275-1,354
Danaos Ship Management	Cargo	3	5	219-1,290
Eastern Navigation	Cargo	5	5	207-517
Haldia Nirman	Cargo	1	1	774
Krishna Shipping & Logistics	Cargo	2	4	219-1,058
Mahalaxmi Engicon	Cargo	1	1	427
Rajesh Auto Merchandise	Cargo	4	7	1,351-1,673
Suman Forwarding	Cargo	2	2	798
Tirupati Vessel	Cargo	1	1	629
Ocean whale	Cargo	1	1	1,830
Total		24	33	
Assam Bengal Navigation	Cruise	1	6	899
Indus River Cruises	Cruise	1	1	463
Total		2	7	

Average vessel size moving across the Lock Gate

The table below shows the GRT analysis of vessels crossing the lock gate in FY19 and FY20 (Apr-Dec'19). In FY19, the largest category of vessels crossing the lock gate were vessels with GRT less than 100. There were 72 vessel crossings in this category, which mainly comprised of Motor Vessels, Survey Launches, Tug and Dredgers. The next highest category constituted vessels with GRT between 100 to 499. There were 60 vessel crossings in this category, which mainly comprised of Tugs, Barges and Cargo vessels. The third highest category constituted vessels with GRT between 1,000 to 1,499. There were 48 vessel crossings in this category with all vessels being cargo vessels.

In FY20 from April'19 to Dec'19, the largest category of vessels crossing the lock gate was of vessels having GRT less than 100. There were 58 vessel crossings in this category mainly comprising of Motor Vessels and Survey Launches. The next highest category was of vessels with GRT between 100 to 499, with total 39 vessel crossings in this category comprising of Survey Launches Tugs, Barges and Cargo vessels.

Table 7- GRT analysis of Vessels crossing the Lock Gate in FY19 & FY20

GRT range	< 100	100-499	500 – 999	1,000 1,499	1,500 & above	NA*	Total
FY 2018-19	72	60	24	48	3	31	238
Apr – Dec 2018	58	53	19	23	2	21	176
Apr – Dec 2019	60	39	21	17	3	28	168

* *Mostly Country boats and FRP boats*

The figure below represents the comparative analysis of the GRT of vessels crossing lock gate in FY19, April'18 to Dec'18 and April'19 to Dec'19. There is a marginal decrease (8 vessels) of overall vessels crossing the lock gate over the previous year in the same period. The major increase over the last year has been in the categories of less than 100 GRT. The major decrease over last year has been in the categories of GRT from 100 to 499 and of GRT 1,000 to 1,499. Both these categories mainly comprise of cargo vessels, tugs and barges.

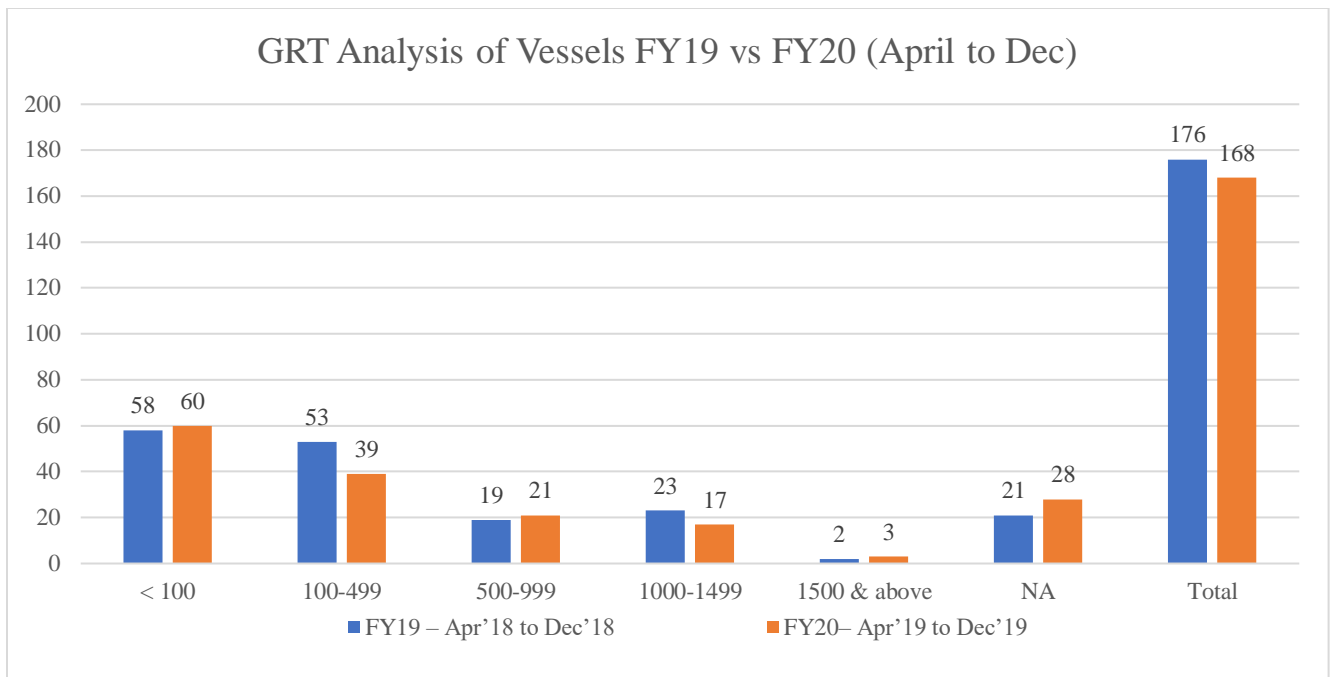


Figure 6- GRT analysis of vessels crossing Lock Gate

Lock Gate Annual Capacity

In FY19, a total of 238 vessels crossed the Farakka lock gate. The top five vessel categories among these crossings - namely cargo vessels, tugs, motor vessels, country boats and survey launches each took average time between 1 hour 15 mins and 1 hour 28 minutes to cross the lock gate. Survey Launch consumed the maximum time of 1 hour 28 mins per crossing, while tugs consumed the least time of 1 hour 15 mins per crossing. Cargo vessels, Motor Vessels and country boats consumed 1 hour 27 mins, 1 hour 26 mins and 1 hour 23 mins respectively.

The other vessel categories i.e. River Cruises, Dredgers, Pontoon, FRP Boat and Houseboat took relatively lesser time to cross the lock gate, however the number of crossings were small (20% of total crossings) as compared to the top five categories (please refer Table 8 for details).

The overall average of the lock gate crossing time for all categories of vessels is 1 hour 23 minutes and same has been considered to calculate the Lock gate's annual capacity.

Table 8- Vessel Wise Lock Gate Crossing Timings in FY19

Type of vessel	Number of Crossings in FY-19	Average time required to cross the lock gate: (in hours)
Cargo vessel	65	1:27
Tug	48	1:15
Motor Vessel	31	1:26
Country boat	25	1:23
Survey Launch	20	1:28
Barge	16	1:28
River Cruise	11	1:20
Dredger	8	1:11
Pontoon	5	1:23
FRP Boat	4	1:03
Houseboat	3	1:30
MUC	1	1:00
Patrol boat	1	1:50
Total	238	1:23

Considering 330 days of Lock gate operations (10% maintenance & repair down time considered) with 24 hours/day of operations, the capacity of Lock gate is estimated as approx. 5,700 vessels crossings p.a.

With the new and state of the art navigational lock gate being constructed at an adjacent site under the Jal Marge Vikas Project (JMVP), the efficiency of the lock gate operations is expected to increase which will result in higher vessel crossing capacity. The optimum time envisaged for crossing the new lock gate is expected to be 38 minutes, while an immediate sequential crossing in the opposite direction is envisaged to take 23 minutes. The capacity of lock gate has been calculated considering the probability of immediate sequential crossing in the opposite direction as 10%.

Table 9- Annual Vessel Handling Capacity of the lock gate

Sr. No	Scenario	Annual Capacity
1	Existing Navigational Lock	5,700 vessels
2	New Navigational Lock	13,000 vessels

With the current lock gate, approx. 5,700 vessels can cross the lock gate in a year, whereas with the upcoming lock gate under JMVP, the capacity will increase to approx. 13,000 vessels. This is mainly due to the higher efficiency of the upcoming navigational lock gate.

A point to note is that there is a possibility of letting 2 suitably dimensioned vessels cross the lock gate at the same time, however the likelihood of occurrence of this scenario is very low and hence has not been considered for capacity calculation.

Conclusion

1. The number of vessels crossing the Farakka lock gate have marginally decreased by 5% in FY20 (April'19 to Dec'19) as compared to the same period last year. This decrease is mainly in two categories of vessels i.e. GRT less than 100 and GRT between 1,000 to 1,499.
2. In terms of cargo vessels, the number of vessel crossings has almost remained constant over last year (in April-December 2019 period), however the number of unique cargo vessels has risen.
3. There has been an increase in the private operators handling cargo vessels from 5 in FY19 to 11 in FY20 (April'19 to Dec'19).
4. Over both the years, the category mix of the top 80% of vessels crossing the lock gate has remained the same.

5. Cargo vessel, Tugs, Survey Launch, Country Boat and Motor Vessel have remained the top 5 categories with Cargo vessels being the highest category both the years.
6. The annual vessel handling capacity of the current Farakka lock is estimated to be approx. 5,700 vessel crossings. The upcoming lock will have capacity to handle approx. 13,000 vessels, which is more than double of the current lock gate's capacity.