

GOVERNMENT OF INDIA  
MINISTRY OF SHIPPING  
RAJYA SABHA  
STARRED QUESTION NO- \*143  
ANSWERED ON- 24.12.2018

**DEVELOPMENT OF NATIONAL WATERWAYS**

\*143: SHRI V. MURALEEDHARAN:

Will the Minister of SHIPPING be pleased to state:

- (a) the details of development of National Waterways during the period from 2014 to 2018;
- (b) the details and present status of waterways projects approved and being implemented in southern States, project-wise;
- (c) whether any proposal has been received from the Kerala Government for development of National Waterway in the State; and
- (d) if so, the details thereof?

**ANSWER**

MINISTER OF SHIPPING  
(SHRI NITIN GADKARI)

(a) to (d) A statement is laid on the Table of the House.

**STATEMENT REFERRED TO IN REPLY TO PARTS (A) TO (D) OF RAJYA SABHA  
STARRED QUESTION NO.\*143 FOR 24.12.2018 RAISED BY SHRI V.  
MURALEEDHARAN, M.P. ON “DEVELOPMENT OF NATIONAL WATERWAYS”**

(a) Under the National Waterways Act, 2016, 106 new National Waterways (NWs) have been declared, in addition to the existing 5 NWs, for promoting, shipping and navigation on them. In the process, the length of NWs has increased from 4382 km to over 20,000 km. NW-1, 2 and 3 are operational and cargo and passenger are moving on them.

To augment the navigation capacity in the Haldia - Varanasi stretch of NW-1, the Jal Marg Vikas Project is being implemented at an estimated cost of Rs.5369 crore with technical and financial assistance of the World Bank. The project includes fairway development, construction of multimodal terminals, intermodal terminals, Ro-Ro terminals, navigational lock at Farakka, River Information System, vessel repair and maintenance complex etc. The project is to be completed by March, 2023.

On NW-2 (Brahmaputra), Ro-Ro services have been introduced between Dhubri to Hatsingimari and Neamati to Kamlabari.

In Vijaywada to Muktyala stretch on river Krishna on NW-4, the work for fairway development and installation at four terminals is going on and Ro-Ro services have commenced.

To undertake the development on NW-5, DPR has been taken up for Front End Engineering Design (FEED) and EPC tender document for construction of Weirs/ Barrages with navigational locks and check dams between Pankopal and Paradip/ Dhamra (Phase-I).

Out of the 106 new NWs, Detailed Project Reports (DPRs) of 30 technically viable NWs have been prepared as per details at **Annex-I** and development activities have been initiated on 10 new NWs as per list at **Annex-II**.

(b) The present status of development of National Waterways in the Southern States is at **Annex-III**.

(c) & (d) The Government of Kerala has submitted a proposal for further expansion of NW-3, from Kollam to Kovalam 78 km in the south, and from Kozhikode to Bekal 205 km in the north. It has been decided to first undertake the development in the existing stretch of NW-3 and not to extend it further.

**LIST OF 30 NATIONAL WATERWAYS HAVING DPR's**

<b>Sl. no.</b>	<b>River/Canal (NWs)</b>	<b>States</b>	<b>Length (km)</b>
1	GHAGHRA RIVER (NW-40)	U.P & Bihar	354
2	KOSI RIVER (NW-58)	Bihar	236
3	GANDAK RIVER (NW-37)	Bihar & U.P.	296
4	SUNDERBANS WATERWAY (NW-97)	West Bengal	201
5	CUMBERJUA RIVER (NW-27)	Goa	17
6	MANDOVI RIVER (NW-68)	Goa	41
7	ZUARI RIVER (NW-111)	Goa	50
8	BARAK RIVER (NW-16)	Assam	121
9	RUPNARAYAN RIVER (NW-86)	West Bengal	45
10	SUBANSIRI RIVER (NW-95)	Assam	106
11	BAITARNI RIVER (NW-14)	Odisha	48
12	MAHANADI -LUNA RIVER (NW-64)	Odisha	98
13	AMBA RIVER (NW-10)	Maharashtra	45
14	REVADANDA CREEK - KUNDALIKA RIVER (NW-85)	Maharashtra	31
15	MAHI RIVER (NW-66)	Gujarat	247
16	NARMADA RIVER (NW-73)	Gujarat & Maharashtra	226
17	TAPI RIVER (NW-100)	Gujarat	173
18	SUBARNAREKHA RIVER (NW-96)	Odisha	30
19	AJOY (AJAY) RIVER (NW-7)	West Bengal	19
20	ICHAMATI RIVER (NW-44)	West Bengal	63
21	KABINI RIVER (NW-51)	Karnataka	23
22	CHAPORA RIVER (NW-25)	Goa	25
23	DABHOL CREEK - VASHISHTI RIVER (NW-28)	Maharashtra	45
24	MAPUSA - MOIDE RIVER (NW-71)	Goa	27
25	SAVITRI RIVER (BANKOT CREEK) (NW-89)	Maharashtra	45
26	GURUPUR RIVER (NW-43)	Karnataka	10
27	ALAPPUZHA- CHANGANASSERY CANAL (NW-8)	Kerala	29
28	ALAPPUZHA- KOTTAYAM - ATHIRAMPUZHA CANAL (NW-9)	Kerala	52
29	KOTTAYAM-VAIKOM CANAL (NW-59)	Kerala	19
30	Kalyan-Thane-Mumbai Waterway, Vasai Creek and Ulhas river (NW- 53)	Maharashtra	145

**List of 10 NWs on which development activities have been initiated**

<b>Name of the Waterway</b>	<b>Status and Time-frame</b>
<b>1. River Barak (NW-16)</b>	Development at a cost of Rs. 76.01 crore for years 2016-17 to 2019-20 for Phase -1 of NW-16 from Silchar to Bhanga has commenced. Maintenance dredging for fairway development work in Silchar-Bhanga stretch has commenced. Consultant has been engaged for the upgradation of terminals at Badarpur, Karimganj and new floating terminal at Silchar. Waterway is operational with limited infrastructure facility.
<b>2. River Gandak (NW-37)</b>	Development at a cost of Rs.12.91 crore for years 2017-18 to 2018-19 including fairway maintenance work has commenced. Waterway is operational with limited infrastructure facility.
<b>Waterways in Goa</b>  <b>3. NW-27-Cumberjua</b> <b>4. NW 68 – Mandovi</b> <b>5. NW 111 – Zuari</b>	A proposal for the development of NWs in Goa at an estimated cost of Rs. 22.65 crore for years 2017-18 to 2018-19 has been approved. Work is proposed to be executed through Government of Goa with the assistance of Mormugao Port Trust. A Tripartite MoU has been signed for the commencement of works. Tendering for 4 floating jetties is under process. NWs of Goa are operational.
<b>6. Alappuzha – Kottayam – Athirampuzha Canal (NW-9) :</b>	Proposal for development of the waterway at an estimated cost of Rs. 1.60 crore for years 2017-18 to 2018-19 has been approved. Night navigation facilities has been procured and installed. Dredging is proposed departmentally. Waterway is already operational for ferry services.
<b>7. River Rupnarayan (NW-86)</b>	Proposal for development of the waterway at an estimated cost of Rs. 24.00 crore for years 2017-18 to 2018-19 has been approved. Work has been awarded for setting up of floating terminal. Tendering for dredging is at an advanced stage. Waterway is operational.
<b>8. Sunderbans Waterways (NW-97)</b>	Proposal for the development of waterway at an estimated cost of Rs. 18.10 crore for years 2017-18 to 2018-19 has been approved. Work order has been issued for dredging. Waterway is part of Indo-Bangladesh Protocol route and already operational for vessels.
<b>9. River Kosi (NW-58)</b>	Project proposal sanctioned for Rs. 15.68 crore for years 2018-19 to 2019-20 to develop the waterway with minimum required infrastructure (bandalling, channel marking, floating terminals and conducting monthly survey etc.). Waterway is operational.
<b>10. River Ghagra (NW-40)</b>	An amount of Rs. 11.60 crore for years 2018-19 to 2019-20 has been approved for fairway development by bandalling and day channel marking, creation of floating terminals and monthly surveys.

**STATUS OF DEVELOPMENT OF NATIONAL WATERWAYS IN SOUTHERN STATES**

Sl. No.	River/Canal (NWs)	States	Length (km)	Status
1.	<b>National Waterway 3:</b>	Kerala		
	West Coast Canal (Kottapuram - Kollam), Champakara and Udyogmandal Canals		205	Fully operational
	West Coast Canal (Kottapuram - Kozhikode)		170	Study in Progress
2.	<b>National Waterway 4:</b>	Andhra Pradesh, Telangana, Chhattisgarh, Karnataka, Tamil Nadu, Pondichery and Maharashtra	2890	
	Krishna river (Wazirabad to Vijayawada)		157	Phase-1 Development activities initiated
	Kakinada Canal (Kakinada to Rajahmundry)		50	DPRs available
	Godavari river (Bhadrachalam to Rajahmundry)		171	
	Eluru Canal (Rajahmundry to Vijayawada)		139	
	Commamur Canal (Vijayawada to Peddaganjam)		113	
	North Buckingham Canal (Peddaganjam to Central Station of Chennai)		316	
	South Buckingham canal (Central Station of Chennai to Marakanam)		110	
	Marakanam to Puducherry through Kaluvelly tank		22	
	River Godavari (Bhadrachalam - Nashik)		1202	
River Krishna (Wazirabad - Galagali)	636	Feasibility study completed		
3.	<b>Alappuzha – Kottayam – Athirampuzha Canal (NW-9) :</b>	Kerala	40	Development activities initiated
4. 5. 6.	<b>Waterways in Goa</b>	Goa	17	Development activities initiated
	NW-27-Cumberjua		41	
	NW 68 – Mandovi		50	
	NW 111 – Zuari			
7.	<b>Chapora River (NW-25)</b>		25	DPRs available
8.	<b>Mapusa - Moide River (NW-71)</b>		27	
9.	<b>Alappuzha- Changanassery Canal (NW-8)</b>	Kerala	29	DPRs available
			19	
10.	<b>Kottayam-Vaikom Canal (NW-59)</b>			
11.	<b>Kabini River (NW-51)</b>	Karnataka	23	DPR available
12.	<b>Netravathi River (NW-74)</b>		30	DPRs under Preparation
13.	<b>Kali River (NW-52)</b>		53	
14.	<b>Sharavati River (NW-90)</b>		29	
<b>On completion of Feasibility Studies, following NWs found not feasible for shipping and navigation:</b>				
1	<b>Pennar River (NW-79)</b>	Andhra Pradesh	28	Not feasible
2	<b>Panchagangavali (Panchagangoli) River (NW-76)</b>	Karnataka	23	
3	<b>Udayavara River (NW-105)</b>	Karnataka	15	
4	<b>Sal River (NW-88)</b>	Goa	14	
5	<b>Kaveri - Kollidam River System (NW-55)</b>	Tamil Nadu	311	
6	<b>Palar River (NW-75)</b>	Tamil Nadu	142	
7	<b>Pazhyar River (NW-77)</b>	Tamil Nadu	20	
8	<b>Ponniyar River (NW-80)</b>	Tamil Nadu	126	
9	<b>Tamaraparani River (NW-99)</b>	Tamil Nadu	62	

GOVERNMENT OF INDIA  
MINISTRY OF SHIPPING  
**RAJYA SABHA**  
UNSTARRED QUESTION NO- 1561  
ANSWERED ON-24.12.2018

**DEVELOPMENT OF INDIAN WATERWAYS IN ANDHRA PRADESH**

1561: SHRI T. G. VENKATESH:

Will the Minister of SHIPPING be pleased to state:

- (a) whether a hydro-graphic survey for development of Waterways in the State of Andhra Pradesh, has been completed to develop Waterways corridor from Kakinada to Chennai, if so, the details thereof and the present status of the project;
- (b) the quantum of funds proposed to be allocated for this project;
- (c) whether any fund has been released and if so, the details thereof;
- (d) the details of the progress made so far; and
- (e) the steps being taken by Government for its early completion?

**ANSWER**

MINISTER OF STATE IN THE MINISTRY OF SHIPPING  
(SHRI MANSUKH L. MANDAVIYA)

(a) A detailed hydrographic survey has been completed in respect of Kakinada to Ennore stretch of National Waterway (NW) -4.

Development of NW-4 is planned in three phases:-

- i. Phase-I : Vijayawada – Muktyala stretch of Krishna River.
- ii. Phase-II : Kakinada to Vijayawada and Rajahmundry to Polavaram.
- iii. Phase-III : Remaining stretches of NW-4 on completion of Phase-I & II.

(b) to (e) Development works on Phase-I have commenced at a cost of Rs. 96 crore, out of which Rs. 24 crore has been utilized. This includes dredging, setting up of four floating terminals and land acquisition for construction of permanent terminal facilities at Ibrahimpatnam, Harischandrapuram and Muktyala. Comprehensive hydrographic and navigation study for Phase-II has also started.

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GOVERNMENT OF INDIA  
MINISTRY OF SHIPPING  
**RAJYA SABHA**  
**UNSTARRED QUESTION NO-1562**  
**ANSWERED ON – 24.12.2018**

**OIL SPILL IN ENNORE PORT IN TAMIL NADU**

1562. SHRIMATI KANIMOZHI:

Will the Minister of Shipping be pleased to state:

- (a) whether Government is aware of frequent incidents of Oil Spill along the coastline especially at the Ennore Port in Tamil Nadu, if so, action taken to contain the Oil Spill and protect the coastal environment;
- (b) the regulatory mechanisms available to the Coast Guard to contain the Oil Spill, if so, the details thereof; and
- (c) whether the ship and the company have been held accountable to prevent further spillage to protect the coastal environment?

**ANSWER**

MINISTER OF STATE IN THE MINISTRY OF SHIPPING  
(SHRI MANSUKH L. MANDAVIYA)

- (a) Yes, Sir. All Major Ports including Kamarajar Port (formerly Ennore Port), in consultation with Indian Coast Guard, has taken all necessary steps of procuring equipments to contain the Oil Spill and to clean up the spilled oil by deploying Oil spill mitigative equipments.
- (b) National Oil Spill Disaster Contingency Plan (NOS-DCP) delineates the responsibilities of various authorities and their jurisdiction. Indian Coast Guard (ICG) being the national coordinator, supports all authorities in meeting their functional responsibilities for pollution response through NOS-DCP.
- (c) Yes, Sir. “Polluter Pay Policy” is adopted world-wide for pollution response and as per the policy, compensation claim for clean-up operation is claimed by all organizations involved in the clean-up operation from the polluter. Accordingly, a notice under section 356(J) of Merchant Shipping Act, 1958 was issued to the Master and Owner of the vessel and expenses for clean-up process have been paid by the Shipping Company without prejudice to their rights.

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GOVERNMENT OF INDIA  
MINISTRY OF SHIPPING  
RAJYA SABHA  
UNSTARRED QUESTION NO- 1563  
ANSWERED ON - 24.12.2018

**WATER TRANSPORT FOR COMMERCIAL USE**

1563: SHRI RIPUN BORA:

Will the Minister of SHIPPING be pleased to state:

- (a) whether Government proposes to develop water transport system for commercial usage in the country;
- (b) if so, the detailed revival projects of water transport facilities;
- (c) whether Government proposes to redevelop waterways and multi-modal commercial projects on river Ganga and Brahmaputra; and
- (d) the details of plan on dredging of rivers and commercialization of waterways system in the country?

**ANSWER**

MINISTER OF STATE IN THE MINISTRY OF SHIPPING  
(SHRI MANSUKH L. MANDAVIYA)

(a) & (b) Yes, Sir. The following initiatives have been taken by the Government in the last four years to develop Inland Water Transport (IWT) as an environment friendly, economical and supplementary mode of transport:-

- i. Under the National Waterways Act, 2016, 106 new National Waterways (NWs) have been declared, in addition to the existing 5 NWs, for promoting, shipping and navigation on them. In the process, the length of NWs has increased from 4382 km to over 20,000 km. NW-1, 2 and 3 are operational and cargo and passenger are moving on them.
- ii. To augment the navigation capacity in the Haldia - Varanasi stretch of NW-1, the Jal Marg Vikas Project is being implemented at an estimated cost of Rs.5369 crore with technical and financial assistance of the World Bank. The project includes fairway development, construction of multimodal terminals, intermodal terminals, Ro-Ro terminals, navigational lock at Farakka, River Information System, vessel repair and maintenance complex etc. The project is to be completed by March, 2023.
- iii. On NW-2 (Brahmaputra), Ro-Ro services have been introduced between Dhubri to Hatsingimari and Neamati to Kamlabari.
- iv. In the Vijaywada to Muktyala stretch on river Krishna on NW-4, the work for fairway development and installation at four terminals is going on and Ro-Ro services have commenced.

v. To undertake the development on NW-5, DPR has been taken up for Front End Engineering Design (FEED) and EPC tender document for construction of Weirs/ Barrages with navigational locks and check dams between Pankopal and Paradip/ Dhamra (Phase-I).

vi. Out of 106 newly declared National Waterways, Detailed Project Reports (DPRs) of 30 technically viable NWs have been prepared. Out of these 30 NWs, developmental activities have been initiated on 10 NWs.

(c) On NW-1 (River Ganga) a Multi-Modal Terminal (MMT) at Varanasi has been inaugurated by the Hon'ble Prime Minister on 12.11.2018. Work for construction of MMT on Sahibganj (Jharkhand) and Haldia (West Bengal) is going on. As regards NW-2 (river Brahmaputra), a high and low level RCC Jetty has been constructed at Pandu in Assam. This jetty is being used by the vessel operators and is well connected with National Highway (NH) - 31 and also with Kamakhya Railway Station. Ro-Ro services between Dhubri to Hatsingimari and between Neamati and Kamlabari are operational.

(d) IWAI takes up maintenance dredging in National Waterways for promotion of shipping and navigation on them. The Dredging Management Plan of Ganga (NW-1) under JMVP is at **Annex**. Annual maintenance dredging is done in river Brahmaputra (NW-2) for development of 2.5 m Least Available Depth (LAD) in Dhubri-Neamati stretch, 2.0 m LAD in Neamati – Dibrugarh stretch and 1.5 m LAD in Dibrugarh – Sadiya stretch.

As an initiative towards commercialization of waterways, IWAI has engaged M/s KPMG as a consultant for Asset Management and Operational Framework Development for NW-1 under JMVP. The consultancy services was awarded in February, 2018 and the consultants are required to study suitable cost recovery and tariff realization mechanism, market intelligence, development and allocation of risks across all stakeholders, business development plan, marketing and commercial development and development of multimodal logistics parks.

**Dredging Management Plan for NW-1**

- i) Provision of LAD of 3 m and bottom channel width of 45 m on the Haldia - Farakka (351km) stretch through deployment of departmental dredgers/SPCSDs. The estimated quantity of dredging required is 4.813 million CuM.
- ii) Provision of least assured depth (LAD) of 3m and bottom channel width of 45 m on the Farakka-Kahalgaon stretch (146 Kms) through Performance Based Assured Dredging contract. The estimated quantity of dredging required is 2.865 million CuM. Work has commenced at a cost of Rs. 150 crore.
- iii) Provision of LAD of 3 m and bottom channel width of 45 m on the Sultanganj-Mahendrapur stretch (74 Kms) through Performance Based Assured Dredging contract. The estimated quantity of dredging required is 3.369 million CuM. The tender was published on 13.07.2018 and evaluation process is in progress.
- iv) Provision of LAD of 3 m and bottom channel width of 45 m on the Mahendrapur – Barh stretch (71 Kms) through Performance Based Assured Dredging contract. The estimated quantity of dredging required is 3.232 million CuM. The tender was published on 25.07.18 and evaluation process is in progress.
- v) Provision of LAD of 2.5 m and bottom channel width of 45 m on the Barh – Doriganj stretch (109 kms) through quantity based maintenance dredging contract ( Mix & Match – IWAI dredger + SP-CSD from Service Provider). The estimated quantity of dredging required is 8.974 million CuM. The tender process is in progress.
- vi) Provision of LAD of 2.5 m and bottom channel width of 45 m on the Doriganj-Ghazipur stretch (178 kms) through quantity based maintenance dredging contract ( Mix & Match – IWAI dredger + SP-CSD from Service Provider). The estimated quantity of dredging required is 8.665 million CuM. The tender process is in progress.
- vii) Provision of LAD of 2.2 m and bottom channel width of 45 m on the Ghazipur - Varanasi stretch (133 kms) through Performance based Assured Dredging Contract. The estimated quantity of dredging required is 7.120 million CuM.

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GOVERNMENT OF INDIA  
MINISTRY OF SHIPPING  
RAJYA SABHA  
UNSTARRED QUESTION NO- 1564  
ANSWERED ON - 24.12.2018

**DEVELOPMENT OF NATIONAL WATERWAYS**

1564. SHRI AKHILESH PRASAD SINGH:

Will the Minister of SHIPPING be pleased to state:

- (a) whether the detailed development action plan for development of all identified 106 national waterways have been prepared;
- (b) if so, the details thereof alongwith expected time-frame of completion of each project;
- (c) whether the Ministry has carried out any study, which compares use of waterways as medium of transportation as compared to railways and road transport, with respect to its cost effectiveness and effect on environment; and
- (d) if so, the details of findings of the study?

**ANSWER**

MINISTER OF STATE IN THE MINISTRY OF SHIPPING  
(SHRI MANSUKH L. MANDAVIYA)

- (a) & (b) Out of the 106 new National Waterways, declared under the National Waterways Act, 2016, DPRs of 30 technically viable NWs have been prepared as per details at **Annex.-I**. Out of these 30 NWs, development activities have been initiated on 10 NWs as per list at **Annex.-II**.
- (c) & (d) Inland Waterways Authority of India had commissioned RITES to undertake study on Integrated National Waterways Transportation Grid. According to report prepared by RITES in 2014, the cost comparison between Inland Water Transport (IWT) mode and other dominant modes of surface transport viz. Railways and Highways is as below:

Mode	Railways	Highways	IWT
Freight (Rs./T.km)	1.36	2.50	1.06

Similarly, the socio-economic and environmental benefits of IWT mode based on some of the studies undertaken by other organizations are at **Annex.-III**.

**LIST OF 30 NATIONAL WATERWAYS FOUND FEASIBLE:****A. Final DPRs available for 30 NWs :**

Sl. no.	River/Canal (NW#)	States	Length (km)
1	GHAGHRA RIVER (NW-40)	U.P & Bihar	354
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**List of 10 most viable NWs on which development activities have been initiated:**

<b>Name of the Waterway</b>	<b>Status and Time-frame</b>
<b>1. River Barak (NW-16)</b>	Development at a cost of Rs. 76.01 crore for years 2016-17 to 2019-20 for Phase -1 of NW-16 from Silchar to Bhanga has commenced. Maintenance dredging for fairway development work in Silchar-Bhanga stretch has commenced. Consultant has been engaged for the upgradation of terminals at Badarpur, Karimganj and new floating terminal at Silchar. Waterway is operational with limited infrastructure facility.
<b>2. River Gandak (NW-37)</b>	Development at a cost of Rs. 12.91 crore for years 2017-18 to 2018-19 including fairway maintenance work has commenced. Waterway is operational with limited infrastructure facility.
<b>Waterways in Goa</b>  <b>3. NW-27-Cumberjua</b> <b>4. NW 68 – Mandovi</b> <b>5. NW 111 – Zuari</b>	A proposal for the development of NWs in Goa at an estimated cost of Rs. 22.65 crore for years 2017-18 to 2018-19 has been approved. Work is proposed to be executed through Government of Goa with the assistance of Mormugao Port Trust. A Tripartite MoU has been signed for the commencement of works. Tendering for 4 floating jetties is under process. NWs of Goa are operational.
<b>6. Alappuzha – Kottayam – Athirampuzha Canal (NW-9) :</b>	Proposal for development of the waterway at an estimated cost of Rs. 1.60 crore for years 2017-18 to 2018-19 has been approved. Night navigation facilities has been procured and installed. Dredging is proposed departmentally. Waterway is already operational for ferry services.
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<b>9. River Kosi (NW-58)</b>	Project proposal sanctioned for Rs. 15.68 crore for years 2018-19 to 2019-20 to develop the waterway with minimum required infrastructure (bandalling, channel marking, floating terminals and conducting monthly survey etc.). Waterway is operational.
<b>10. River Ghagra (NW-40)</b>	An amount of Rs. 11.60 crore for years 2018-19 to 2019-20 has been approved for fairway development by bandalling and day channel marking, creation of floating terminals and monthly surveys.

**The Socio-economic and environmental benefits of IWT Mode:****1. Cheaper operating cost and relatively lesser fuel consumption**

Factors considered	Rates Considered			Source
	Waterways	Road	Rail	
Energy Consumption	0.0048 Litre/TKm	0.0313 Litre/TKm	0.0089 Litre/TKm	11 <sup>th</sup> Plan Working Group Report on Shipping & IWT
Vehicle Operating Cost	0.843 Rs./TKm	1.170 Rs./TKm	1.009 Rs./TKm	Planning Commission : TTS Study

**2. Less polluting mode of transportation**

Factors considered	Rates Considered (Rs./TKm)			Source
	Waterways	Road	Rail	
Air Pollution	0.03	0.202	0.0366	Planning Commission : TTS Study
Noise Pollution	Negligible	0.0032	0.0012	Permanent International Association of Navigation Congresses (PIANC)
Soil and Water Pollution	Negligible	0.005	Negligible	PIANC

**3. Relatively safer mode of transportation**

Factor considered	Rates Considered (Rs/TKm)			Source
	Waterways	Road	Rail	
Accidents	Negligible	0.0620	0.0010	Planning Commission: TTS Study

**4. Lesser requirement of land relative to other modes of transportation**

Factor considered	Rates Considered (Rs/TKm)			Source
	Waterways	Road	Rail	
Surface occupation	Negligible	0.0002	0.0001	PIANC

**5. More environment friendly mode of transportation**

Factor considered	Rates Considered (Rs/TKm)			Source
	Waterways	Road	Rail	
Emission of GHGs	0.0006	0.0031	0.0006	12 <sup>th</sup> Five Year Plan

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