Chapter 06: Result

6. RESULTS

6.1 Mapping of available water body

From the Google images studied during different seasons it had been observed that there are 18,371 water bodies with total area of (27595.77ha) and each with an area of more than 0.40 ha (Fig 10). The perennial water bodies are 64022 in number at entire district.

6.2 Recorded fish species from the study area

From the study area total 76 numbers of fish species were physically recorded (Table-06). The Community Development Blocks having high species richness are Daspur-I & II, Pingla, Ghatal, Sabang whereas moderate diversity is seen at Gopiballavpur-I & II, Keshiary, Keshpur, Kharagpur-II, Narayangarh, Binpur-I, Chandrakona-I & II, Dantan-I, Debra, Mohanpur. While the lowest diversity observed at Garhbeta- I,II & III, Binpur-II, Jamboni, Jhargram, Kharagpur-I, Midnapur Sadar, Nayagram, Salboni, Sankrail. The finfish diversity justifies with the number of available perennial water bodies of the studied blocks in comparison to the remaining blocks having less number of aquatic bodies.

It has been found from the collected data that there are 23 families under 8 orders among which Cyprinidae family shares the highest number (29) and common to the rest followed by Bagridae, Channidae, Ambassidae, Mastacembelidae, Osphronemidae and Siluridae. Single species found in family Aplochelidae, Badidae, Belonidae, Gobidae, Hemiramphidae, Heteropneustidae, Nandidae, Pangasidae, Serrasalmidae and Synbranchidae (Table 05, Fig 04). Among the 8 orders Cypriniformes showed the highest number of species (31) followed by Perciformes, Siluriformes, Synbranchiformes,Beloniformes, Osteoglossiformes, Characiformes and Cyprinodontiformes (Table 04, Fig. 03).

Order name	Nos.
Beloniformes	2
Characiformes	1
Cypriniformes	31
Cyprinodontiformes	1
Osteoglossiformes	2
Perciformes	19
Siluriformes	15
Synbrachiformes	5

Table 04: Order wise fish species number in the study area

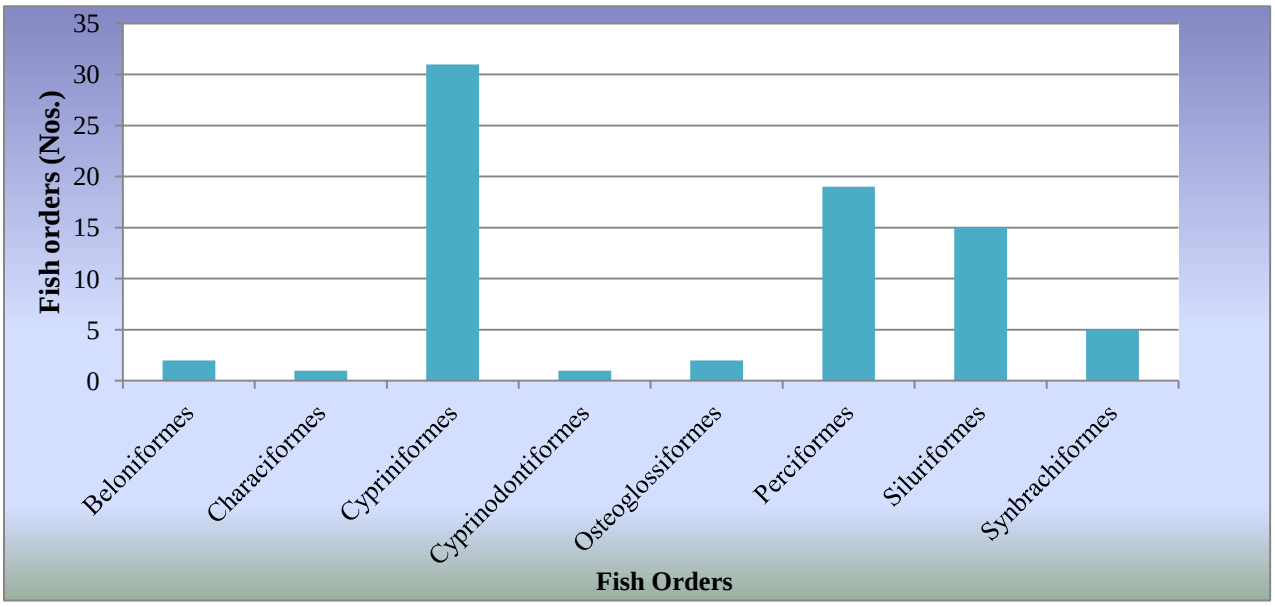


Fig 03: Bar diagram showing order wise fish availability in Paschim Medinipur district

Family name	Nos.
Ambassidae	4
Anabantidae	2
Aplocheilidae	1
Badidae	1
Bagridae	6
Belonidae	1
Channidae	5
Cichlidae	2
Clariidae	2
Cobitidae	2
Cyprinidae	29
Gobidae	1
Hemiramphidae	1
Heteropneustidae	1
Mastacembelidae	4
Nandidae	1
Notopteridae	2
Osphronemidae	3
Pangassidae	1
Schilbeidae	2
Serrasalmidae	1
Siluridae	3
Synbranchidae	1

Table 05: Family wise fish species number in the study area

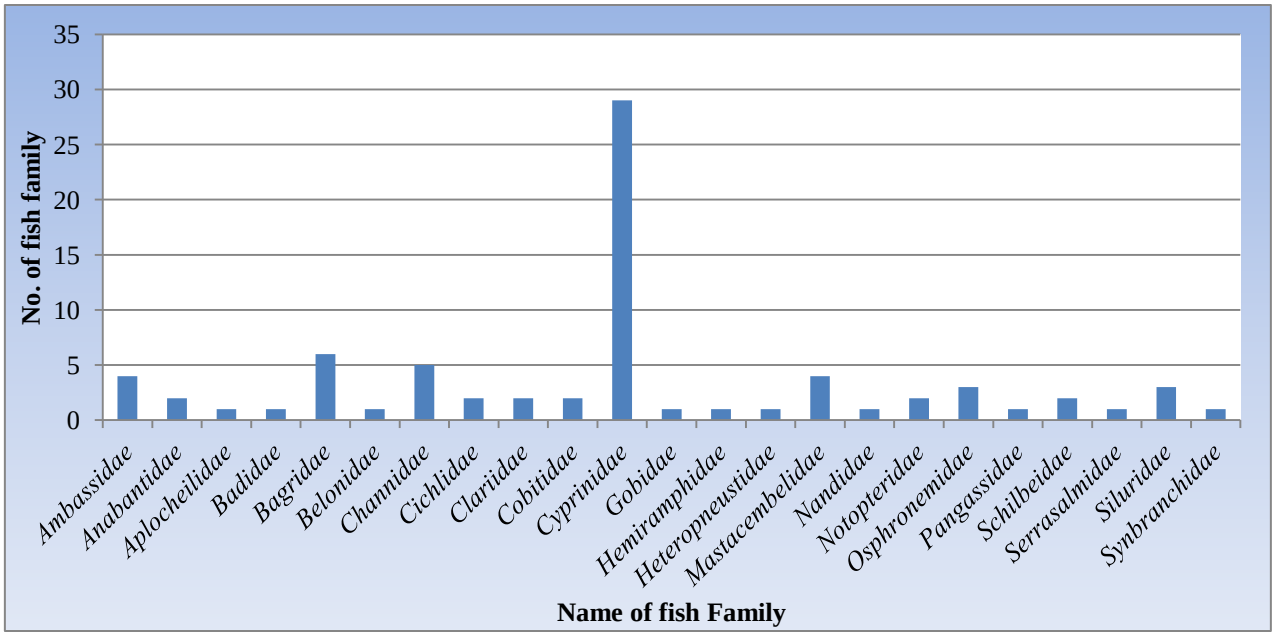


Fig 04: Bar diagram showing family wise fish availability in Paschim Medinipur district

6.3 Qualitative-quantitative distribution

This research study revealed that fish richness is higher in the community development blocks like Daspur-I & II, Ghatal, Pingla, Sabang. Still the culture practice of the fisherman restricted to the few carps and introduced fishes. Therefore the wild indigenous fishes are getting neglected and are being lost. Some fin fish species are dominating because of this. Most of the recorded fish are commercially important and few are ornamental. Some have medicinal importance too.

6.4 Remote sensing-GIS in fishery

Use of remote sensing in fisheries resource management has increased many fold and widely accepted which boost the conventional fishery management practices. RS-GIS gathered data used to generate and visualize the distribution of water bodies in the Paschim Medinipur district as well as the fin fish diversity and conservation priority finfishes and their habitats.

The thematic maps generated based on GIS survey data and other accessory data *viz*., rainfall, soil textures, quality of aquatic parameters help to analyze the scenario of finfish diversity and their conservation status. Also, the statistical diversity indices measures and strengthen the analysis.

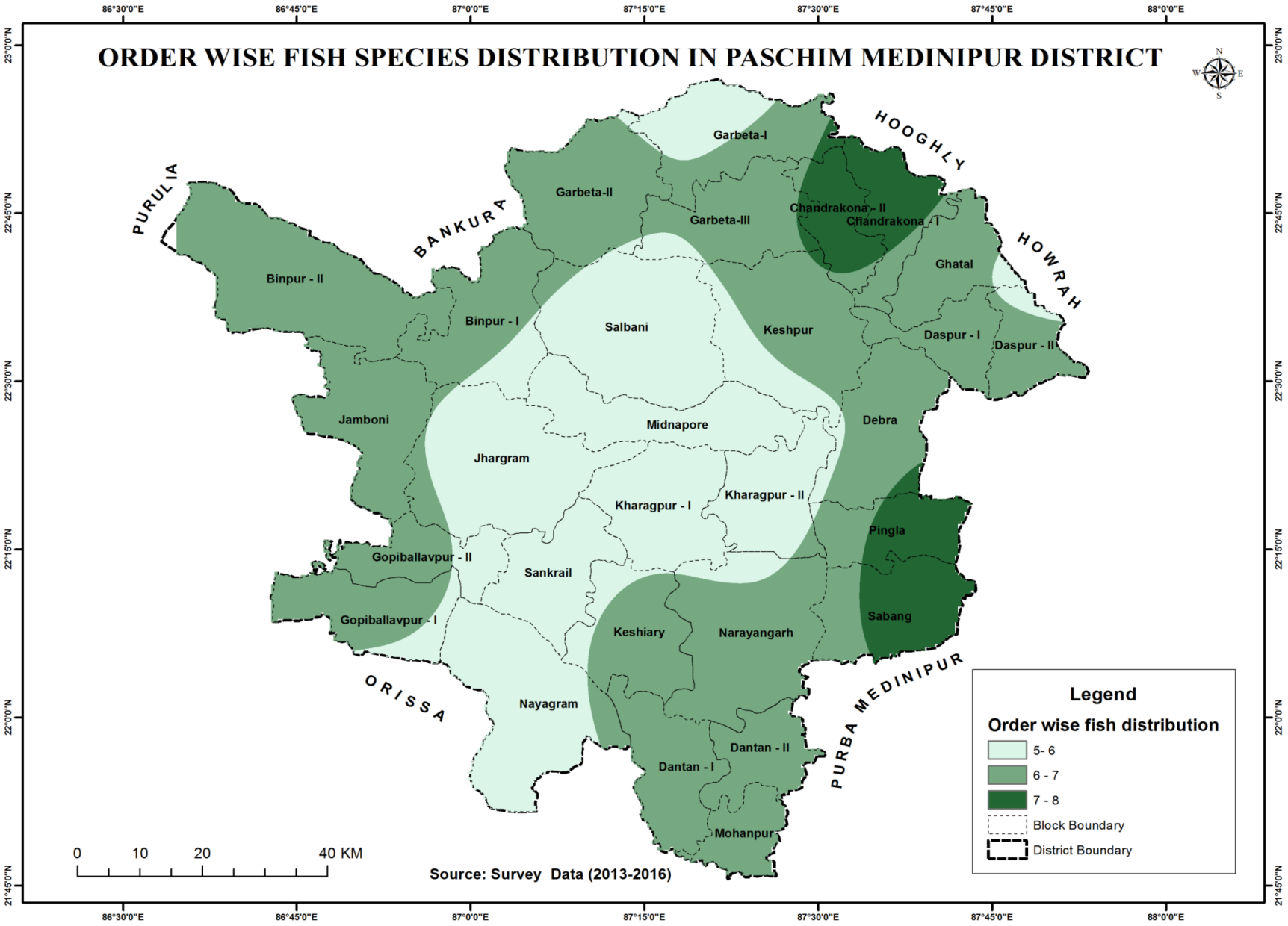


Fig 05: Order wise distribution of fish species in Paschim Medinipur district

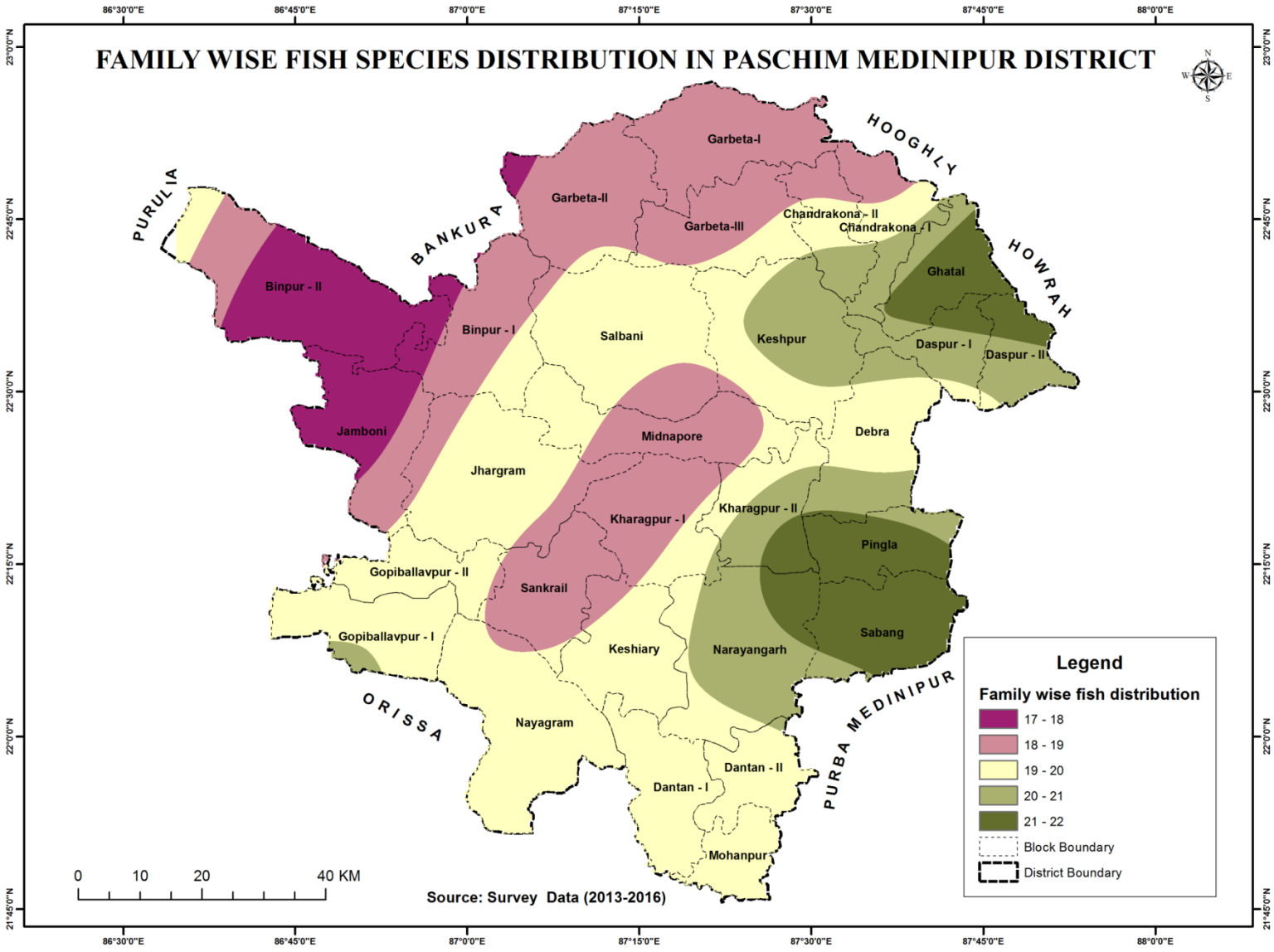


Fig 06: Family wise distribution of fish species in Paschim Medinipur district

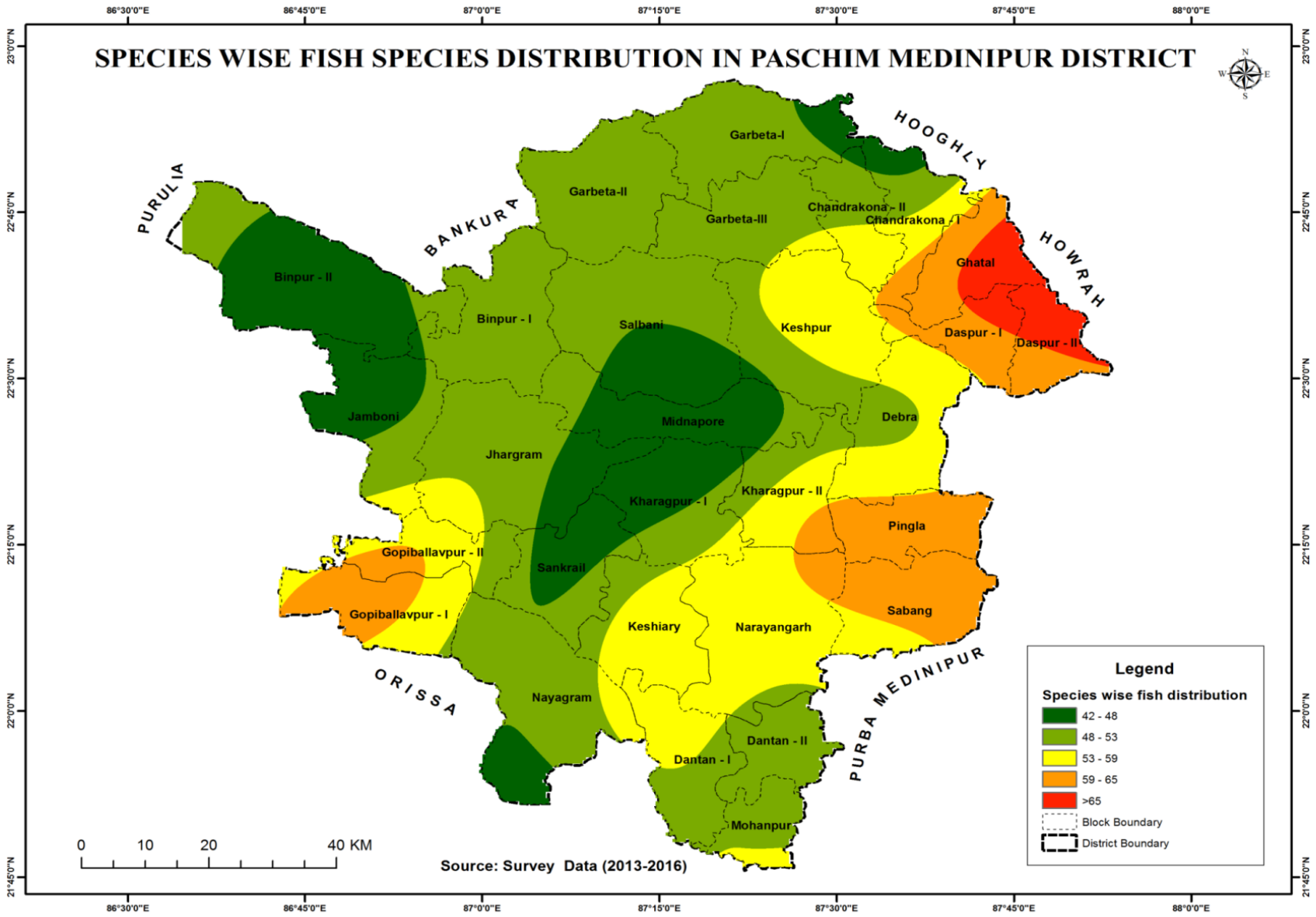


Fig 07: Species wise distribution of fish species in Paschim Medinipur district

Sl. No.	ORDER	FAMILY	SCIENTIFIC NAME	IUCN (Vers. 3.1)
1	Beloniformes	Hemiramphidae	*Hyporamphus affinis* (Günther, 1866)	NE
2	Beloniformes	Belonidae	*Xenentodon cancila* (Hamilton, 1822)	LC
3	Cypriniformes	Cyprinidae	*Amblypharyngodon microlepis* (Bleeker, 1853)	LC
4	Cypriniformes	Cyprinidae	*Amblypharyngodon mola* (Hamilton, 1822)	LC
5	Cypriniformes	Cyprinidae	*Opsarius barna* (Hamilton, 1822)	LC
6	Cypriniformes	Cyprinidae	*Barilius vagra* (Hamilton, 1822)	LC
7	Cypriniformes	Cyprinidae	*Cabdio morar* (Hamilton, 1822)	LC
8	Cypriniformes	Cyprinidae	*Gibelion catla* (Hamilton, 1822)	LC
9	Cypriniformes	Cyprinidae	*Cirrhinus mrigala* (Hamilton, 1822)	LC
10	Cypriniformes	Cyprinidae	*Cirrhinus reba* (Hamilton, 1822)	LC
11	Cypriniformes	Cyprinidae	*Ctenopharyngodon idella* (Valenciennes, 1844)	NE
12	Cypriniformes	Cyprinidae	*Cyprinus carpio* (Linnaeus, 1758)	VU
13	Cypriniformes	Cyprinidae	*Devario devario* (Hamilton, 1822)	LC
14	Cypriniformes	Cyprinidae	*Danio rerio* (Hamilton, 1822)	LC
15	Cypriniformes	Cyprinidae	*Esomus danricus* (Hamilton, 1822)	LC
16	Cypriniformes	Cyprinidae	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	NT
17	Cypriniformes	Cyprinidae	*Labeo bata* (Hamilton, 1822)	LC
18	Cypriniformes	Cyprinidae	*Labeo calbasu* (Hamilton, 1822)	LC
19	Cypriniformes	Cyprinidae	*Labeo rohita* (Hamilton, 1822)	LC
20	Cypriniformes	Cyprinidae	*Laubuka laubuca* (Hamilton, 1822)	LC
21	Cypriniformes	Cobitidae	*Lepidocephalichthys guntea* (Hamilton, 1822)	LC
22	Cypriniformes	Cobitidae	*Lepidocephalichthys thermalis* (Valenciennes, 1846)	LC
23	Cypriniformes	Cyprinidae	*Osteobramma cotio cotio* (Hamilton, 1822)	LC
24	Cypriniformes	Cyprinidae	*Pethia conchonius* (Hamilton, 1822)	LC
25	Cypriniformes	Cyprinidae	*Pethia phutunio* (Hamilton, 1822)	LC
26	Cypriniformes	Cyprinidae	*Pethia ticto* (Hamilton, 1822)	LC
27	Cypriniformes	Cyprinidae	*Puntius chola* (Hamilton, 1822)	LC
28	Cypriniformes	Cyprinidae	*Puntius sophore* (Hamilton, 1822)	LC
29	Cypriniformes	Cyprinidae	*Puntius terio* (Hamilton, 1822)	LC
30	Cypriniformes	Cyprinidae	*Rasbora daniconius* (Hamilton, 1822)	LC
31	Cypriniformes	Cyprinidae	*Salmostoma bacaila* (Hamilton, 1822)	LC

32	Cypriniformes	Cyprinidae	*Salmophasia phulo* (Hamilton, 1822)	LC
33	Cypriniformes	Cyprinidae	*Systomus sarana* (Hamilton, 1822)	LC
34	Cyprinodontiformes	Aplocheilidae	*Aplocheilus panchax* (Hamilton, 1822)	LC
35	Osteoglossiformes	Notopteridae	*Chitala chitala* (Hamilton, 1822)	NT
36	Osteoglossiformes	Notopteridae	*Notopterus notopterus* (Pallas, 1769)	LC
37	Perciformes	Channidae	*Channa gachua* (Hamilton, 1822)	LC
38	Perciformes	Channidae	*Channa marulius* (Hamilton, 1822)	LC
39	Perciformes	Channidae	*Channa orientalis* (Bloch & Schneider, 1801)	NE
40	Perciformes	Channidae	*Channa punctate* (Bloch, 1793)	LC
41	Perciformes	Channidae	*Channa striata* (Bloch, 1793)	LC
42	Perciformes	Anabantidae	*Anabas cobojius* (Hamilton, 1822)	DD
43	Perciformes	Anabantidae	*Anabas testudineus* (Bloch, 1792)	DD
44	Perciformes	Badidae	*Badis badis* (Hamilton, 1822)	LC
45	Perciformes	Ambassidae	*Chanda nama (*Hamilton, 1822)	LC
46	Perciformes	Gobiidae	*Glossogobius giuris* (Hamilton, 1822)	LC
47	Perciformes	Nandidae	*Nandus nandus* (Hamilton, 1822)	LC
48	Perciformes	Cichlidae	*Oreochromis mossambicus* (Peters, 1852)	NT
49	Perciformes	Cichlidae	*Oreochromis niloticus* (Linnaeus, 1758)	NE
50	Perciformes	Ambassidae	*Parambassis baculis* (Hamilton, 1822)	LC
51	Perciformes	Ambassidae	*Parambassis lala* (Hamilton, 1822)	NT
52	Perciformes	Ambassidae	*Parambassis ranga* (Hamilton, 1822)	LC
53	Perciformes	Osphronemidae	*Trichogaster chuna* (Hamilton, 1822)	LC
54	Perciformes	Osphronemidae	*Trichogaster fasciata (*Bloch & Schneider, 1801)	LC
55	Perciformes	Osphronemidae	*Trichogaster lalius* (Hamilton, 1822)	LC
56	Siluriformes	Clariidae	*Clarias batrachus* (Linnaeus, 1758)	LC
57	Siluriformes	Clariidae	*Clarias gariepinus* (Burchell, 1822)	LC
58	Siluriformes	Schilbeidae	*Eutropiichthys vacha* (Hamilton, 1822)	LC
59	Siluriformes	Heteropneustidae	*Heteropneustes fossilis* (Bloch, 1794)	LC
60	Siluriformes	Bagridae	*Mystus bleekeri* (Day, 1877)	LC
61	Siluriformes	Bagridae	*Mystus cavassius* (Hamilton, 1822)	LC
62	Siluriformes	Bagridae	*Mystus gulio* (Hamilton, 1822)	LC
63	Siluriformes	Bagridae	*Mystus tengara* (Hamilton, 1822)	LC
64	Siluriformes	Bagridae	*Mystus vittatus* (Bloch, 1794)	LC
65	Siluriformes	Schilbeidae	*Pachypterus atherinoides* (Bloch, 1794)	LC
66	Siluriformes	Siluridae	*Ompok bimaculatus* (Bloch, 1794)	NT
67	Siluriformes	Siluridae	*Ompok pabda* (Hamilton, 1822)	NT
68	Siluriformes	Pangasiidae	*Pangasius pangasius* (Hamilton, 1822)	LC

69	Siluriformes	Bagridae	*Sperata aor* (Hamilton, 1822)	LC
70	Siluriformes	Siluridae	*Wallago attu* (Bloch & Schneider, 1801)	NT
71	Synbranchiformes	Mastacembelidae	*Macrognathus aculeatus* (Bloch, 1786)	NE
72	Synbranchiformes	Mastacembelidae	*Macrognathus aral* (Bloch & Schneider, 1801)	LC
73	Synbranchiformes	Mastacembelidae	*Macrognathus pancalus* (Hamilton, 1822)	LC
74	Synbranchiformes	Mastacembelidae	*Mastacembelus armatus* (Lacepède, 1800)	LC
75	Synbranchiformes	Synbranchidae	*Monopterus cuchia* (Hamilton, 1822)	LC
76	Characiformes	Serrasalmidae	*Piaractus brachypomus* (Cuvier, 1818)	NE

Table 06: Recorded fish fauna from Paschim Medinipur district along with their conservation status.

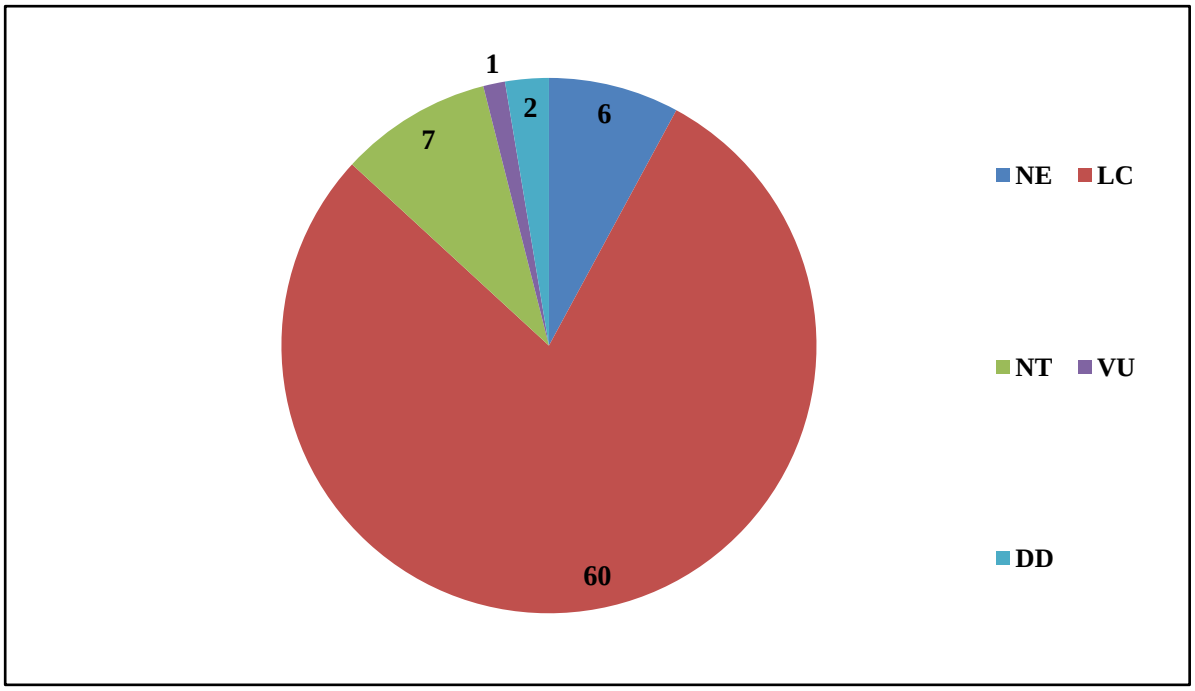


Fig 08: Pie diagram based on the IUCN categories of recorded fish species

As per the IUCN conservation status(Ver 3.1) among the recorded 76 fin fish species 1 species is vulnerable, 7 near threatened, 60 are least concern, 2 data deficient and 6 not evaluated.

Community Development Block Name	pH(0-14)	Temp (0˚C-60˚C)	Salinity (0-50PPT)	TDS (0-19.99 PPT)	Turbidity (0-1000 NTU)	Cond. (0-19.99mS)	OD(0-2.0)	DO (0-19.9 PPM)	ORDER	FAMILY	SPECIES
DASPUR-I	7.5	30.2	0.11	0.13	12.2	0.18	0.27	4.54	7	21	63
DASPUR-II	7.2	29.85	0.07	0.1	12.88	0.18	0.18	4.83	7	21	65
GHATAL	7.4	31.26	0.13	0.09	15.4	0.08	0.05	4.9	7	22	66
GOPIBALLAVPUR-I	7.65	29.4	0.03	0.02	11.1	0.02	0.19	4.2	7	20	59
GOPIBALLAVPUR-II	7.42	29.02	0.01	0.08	32.4	0.08	0.24	4.1	7	20	59
KESHIARY	7.08	29.4	0.03	0.19	19.7	0.3	0.28	3.8	7	20	57
KESHPUR	8.51	35.9	0.21	0.16	14.7	0.29	0.21	3.9	7	21	56
KHARAGPUR-II	7.39	29.9	0.08	0.15	31.9	0.24	0.31	3.8	6	21	56
NARAYANGARH	7.15	30.18	0	0.12	15.1	0.19	0.11	3.75	7	21	57
PINGLA	6.94	29.8	0	0.12	13.2	0.19	0.15	3.42	8	22	62
SABANG	7.43	30.25	0	0.09	16	0.12	0.17	4	8	22	61
BINPUR-I	8.04	31.7	0.15	0.08	22.4	0.13	0.27	3.36	7	19	52
CHANDRAKONA-I	7.5	30.2	0.09	0.14	14.4	0.14	0.18	3.92	8	20	54
CHANDRAKONA-II	7.5	32.7	0.14	0.2	22	0.33	0.18	3.54	8	20	53
DANTAN-I	6.8	30.1	0.05	0.24	22.2	0.39	0.27	3.3	7	20	54
DANTAN-II	7.6	31.3	0.13	0.1	18.17	0.18	0.3	3.37	7	20	51
DEBRA	7.2	30.1	0	0.12	9.86	0.19	0.1	3.91	7	20	53

GARHBETA-II	8.03	33.3	0.16	0.16	38.5	0.14	0.07	3.8	7	19	50
GARHBETA-III	6.7	32.65	0.13	0.26	22.3	0.15	0.08	3.9	7	19	51
MOHANPUR	6.25	29.92	0.1	0.15	16.4	0.24	0.14	2.16	7	20	55
BINPUR-II	7.7	31.6	0.11	0.06	19.9	0.1	0.19	2.49	7	20	51
GARHBETA-I	6.98	31.8	0	0.12	32.3	0.15	0.11	2.95	6	19	49
JAMBONI	8.1	33.74	0.21	0.1	19.5	0.15	0.17	2.46	7	18	47
JHARGRAM	6.84	31.01	0.1	0.19	46.4	0.28	0.17	2.9	6	20	51
KHARAGPUR-I	7.48	30.6	0.15	0.03	22.6	0.06	0.15	2.57	6	19	47
MIDNAPUR SADAR	7.46	29.8	0.1	0.13	20.8	0.21	0.26	2.23	6	19	46
NAYAGRAM	7.03	29.7	0	0.18	13.3	0.19	0.09	3.48	6	20	49
SALBONI	6.14	29.3	0	0.1	14.8	0.18	0.09	3.96	6	20	48
SANKRAIL	6.6	29.1	0.05	0.05	37.2	0.07	0.21	3.41	6	19	47

Table 07: Surveyed Community Development Blocks with mean water parameters and recorded finfish fauna.

Through periodic sampling of finfish fauna and examination of freshwater parameters of 29 CDBs in Paschim Medinipur, it is found that, the Blocks like Daspur-I & II, Sabang, Pingla, Ghatal showed highest fish diversity. The hydro-biological parameters are in a permissible range to support the fish live and their growth in comparison to the other development blocks having moderate and or low quality of freshwater parameters.

	pH	Temp	Salinity	TDS	Turbidity	Cond.	OD	DO	Species
pH	1								
Temp	0.61055	1							
Salinity	0.59191	0.75637	1						
TDS	-0.2337	0.2522	0.08539	1					
Turbidity	-0.0681	0.10409	0.13502	0.13773	1				
Cond.	-0.1651	0.16445	0.05666	0.78015	0.03296	1			
OD	0.26069	-0.1621	0.13271	-0.0348	-0.09864	-0.27923	1		
DO	0.07653	-0.1185	-0.2159	-0.0003	-0.2773	-0.1378	0.1037	1	
Species	0.07109	-0.1967	-0.2036	-0.0652	-0.3933	-0.0174	0.06115	0.70329	1

0.05% level of significance

Table 08: Correlation matrix of the eight water parameters and finfish species of the aquatic bodies of Paschim Medinipur district.

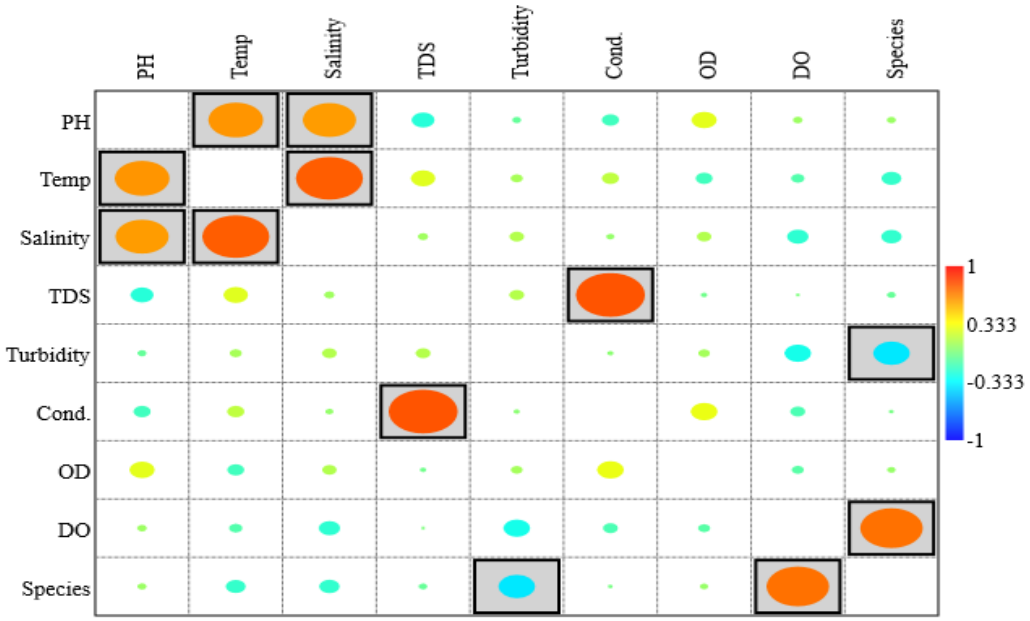


Fig 09: Scatter plot diagram showing the correlations among the aquatic parameters and finfish species

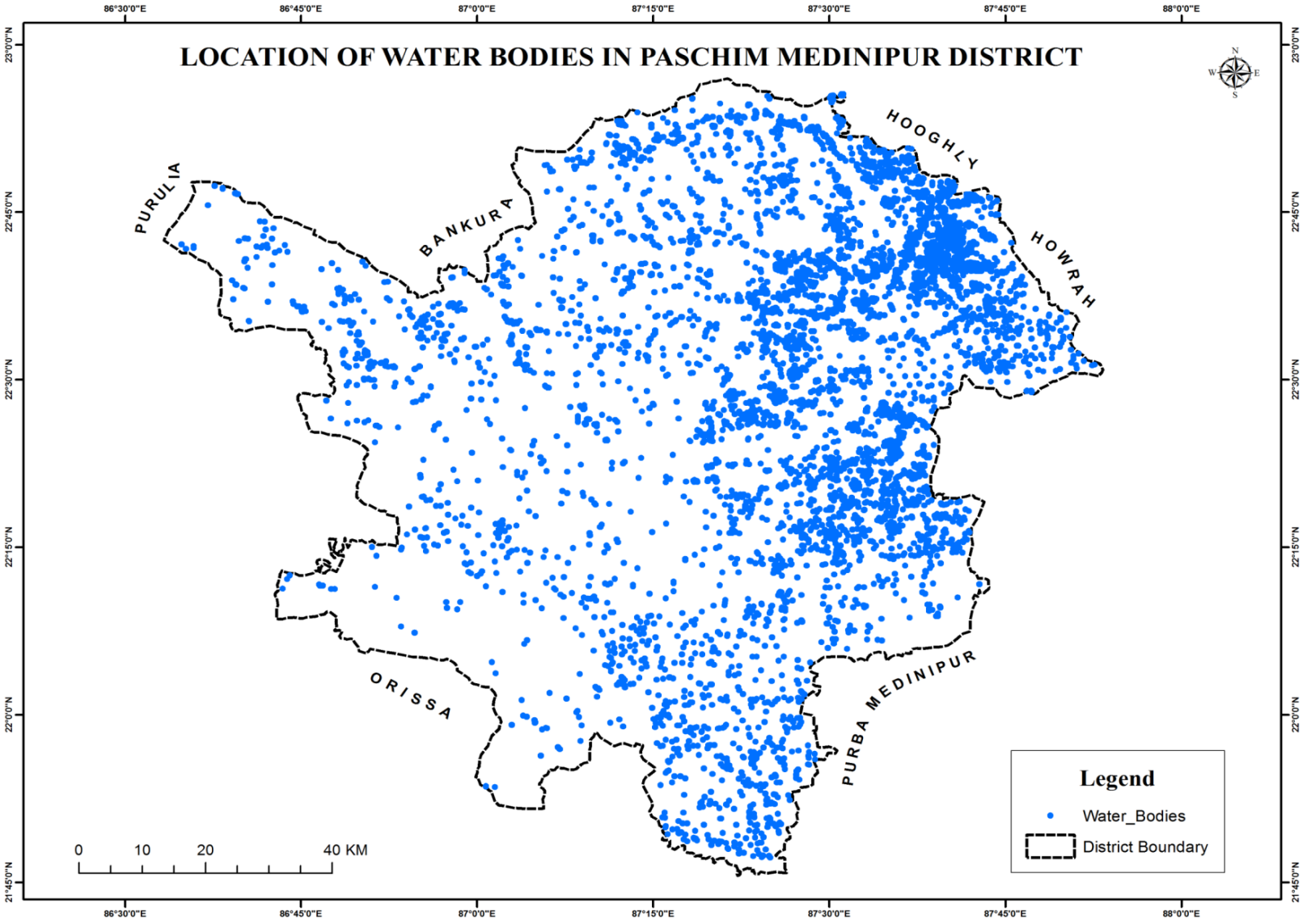


Fig 10: Total freshwater bodies of Paschim Medinipur district

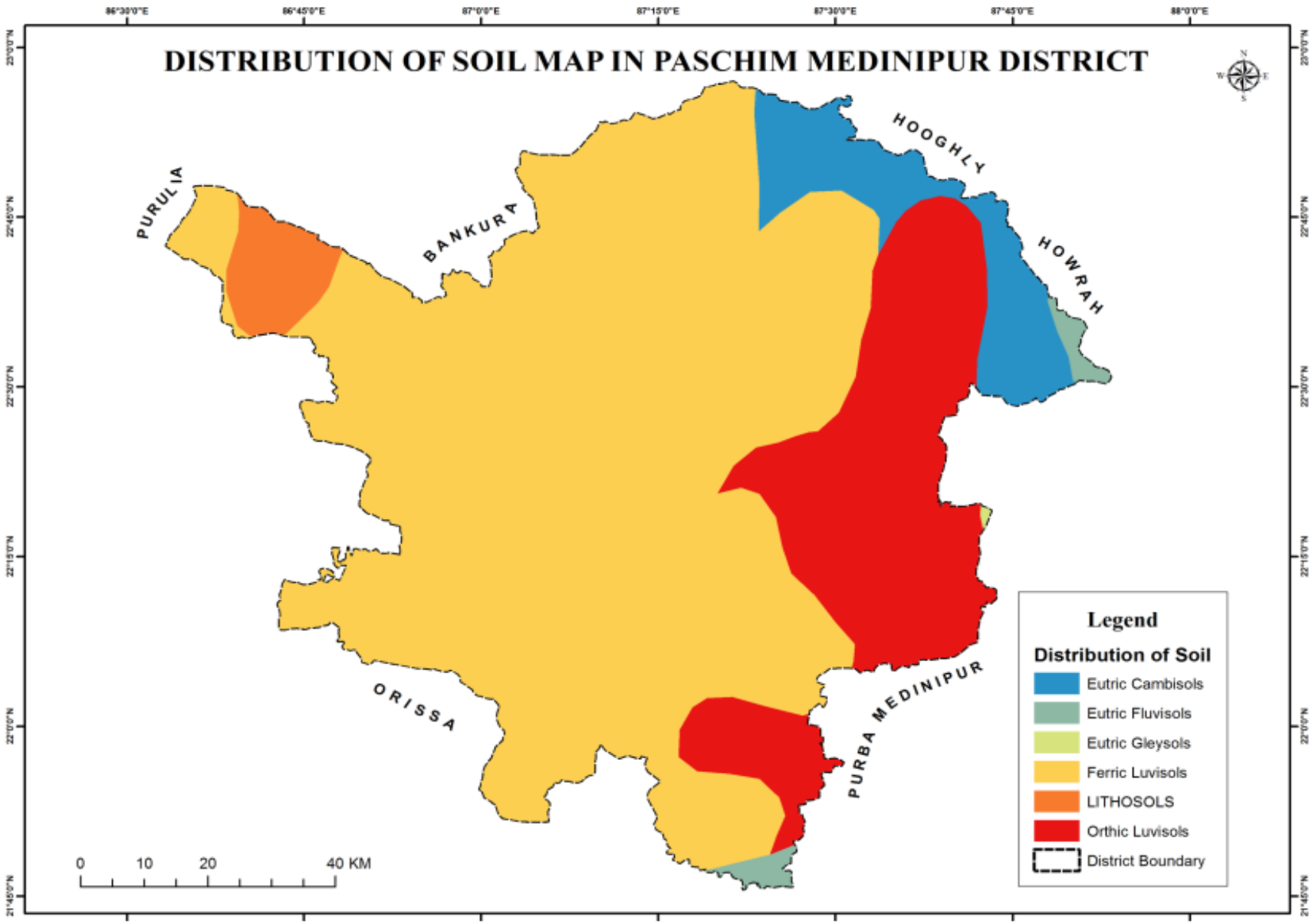


Fig 11: Existing soil types of Paschim Medinipur district

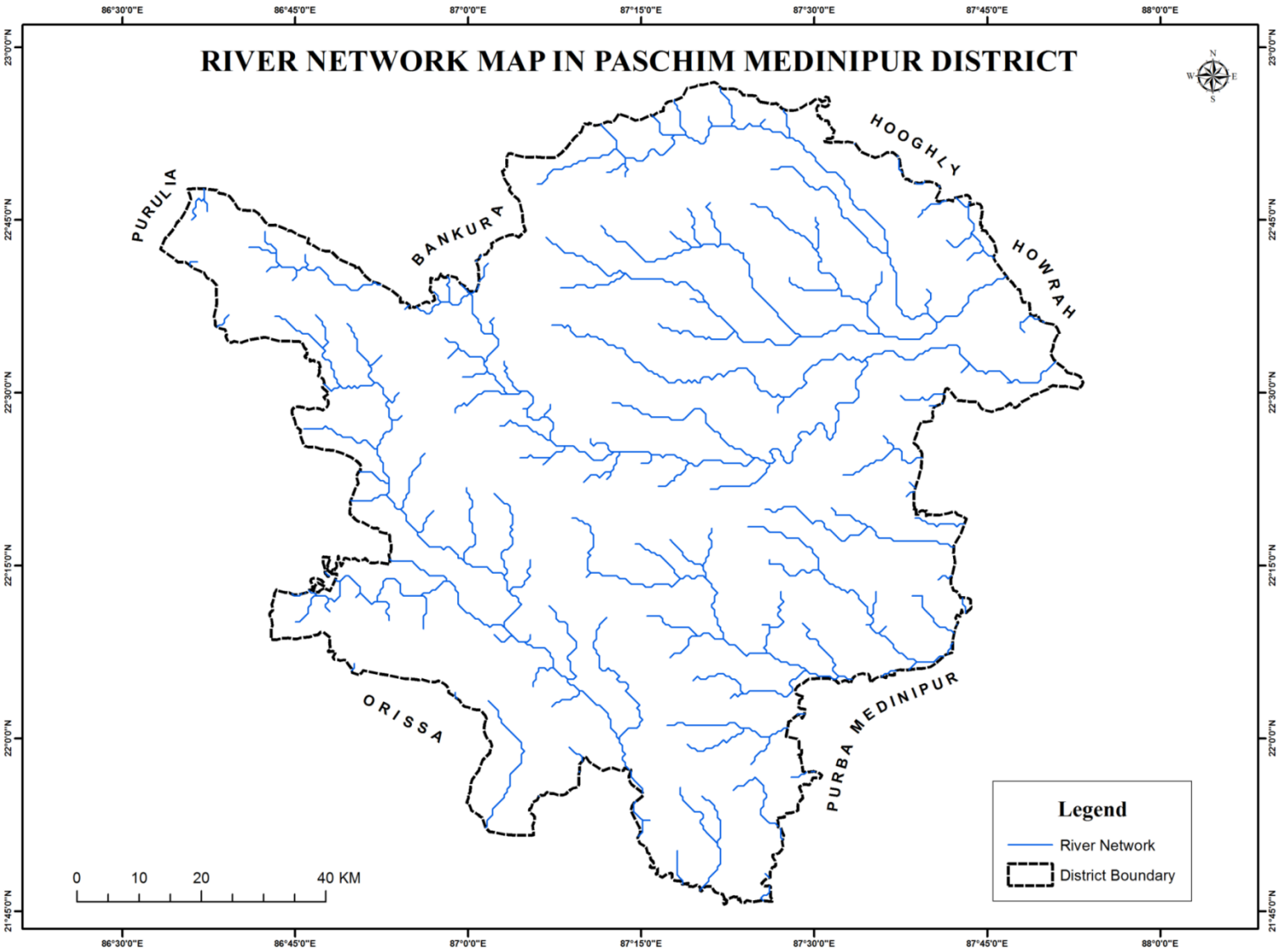


Fig 12: River stretches of Paschim Medinipur district

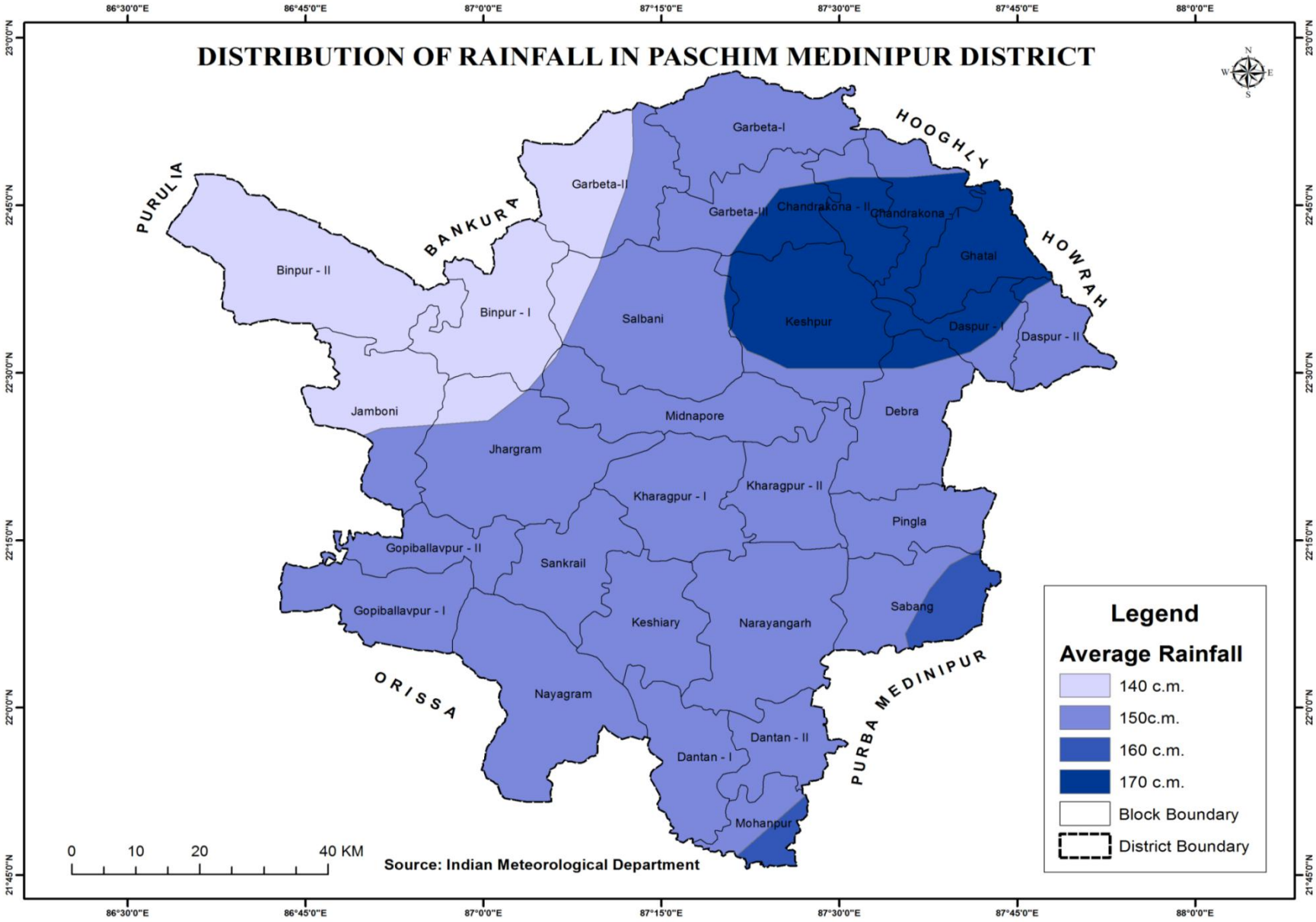


Fig 13: Average rainfalls in the Community Development Blocks of Paschim Medinipur district

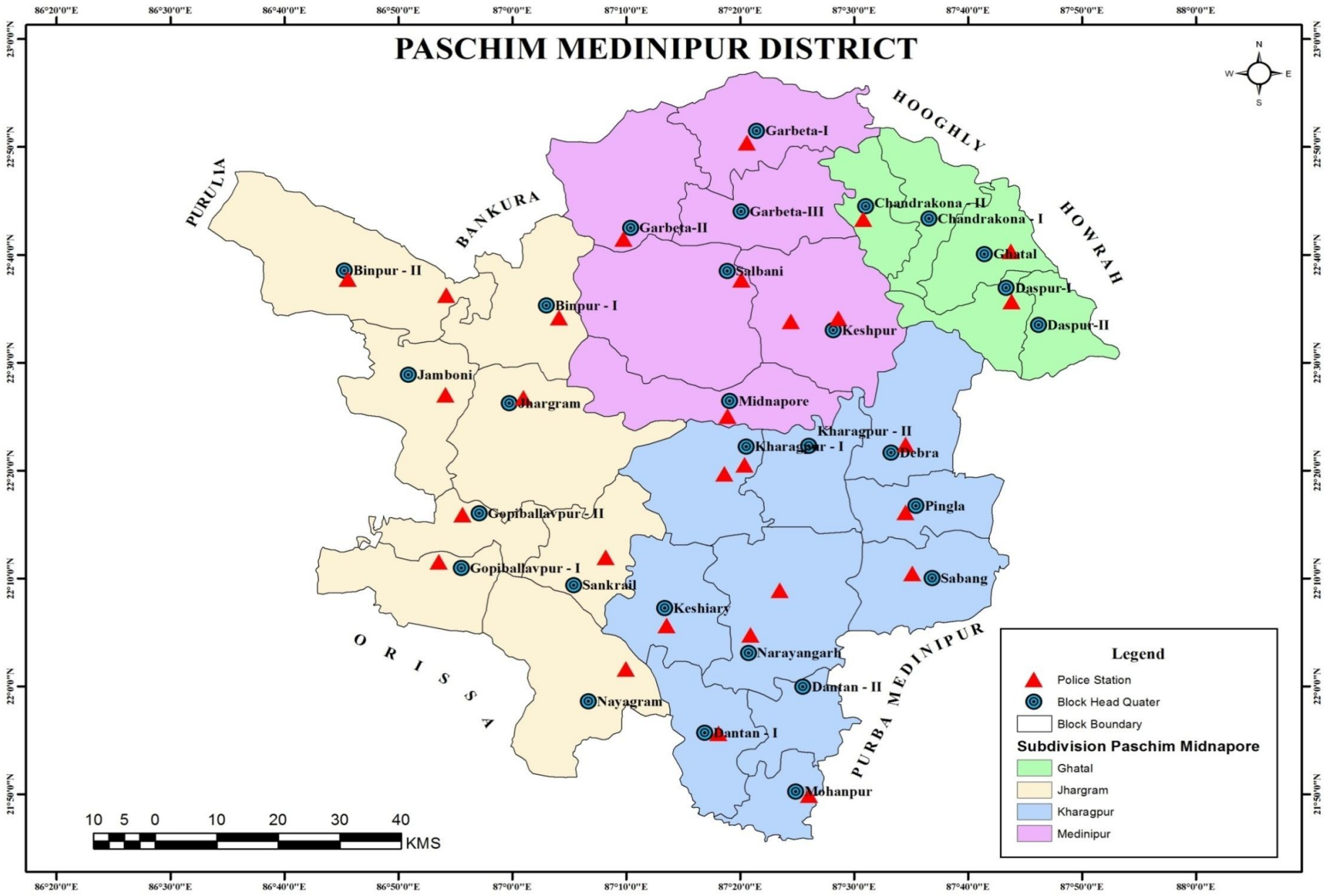


Fig 14: Head Quarters of the Community Development Blocks of Paschim Medinipur district

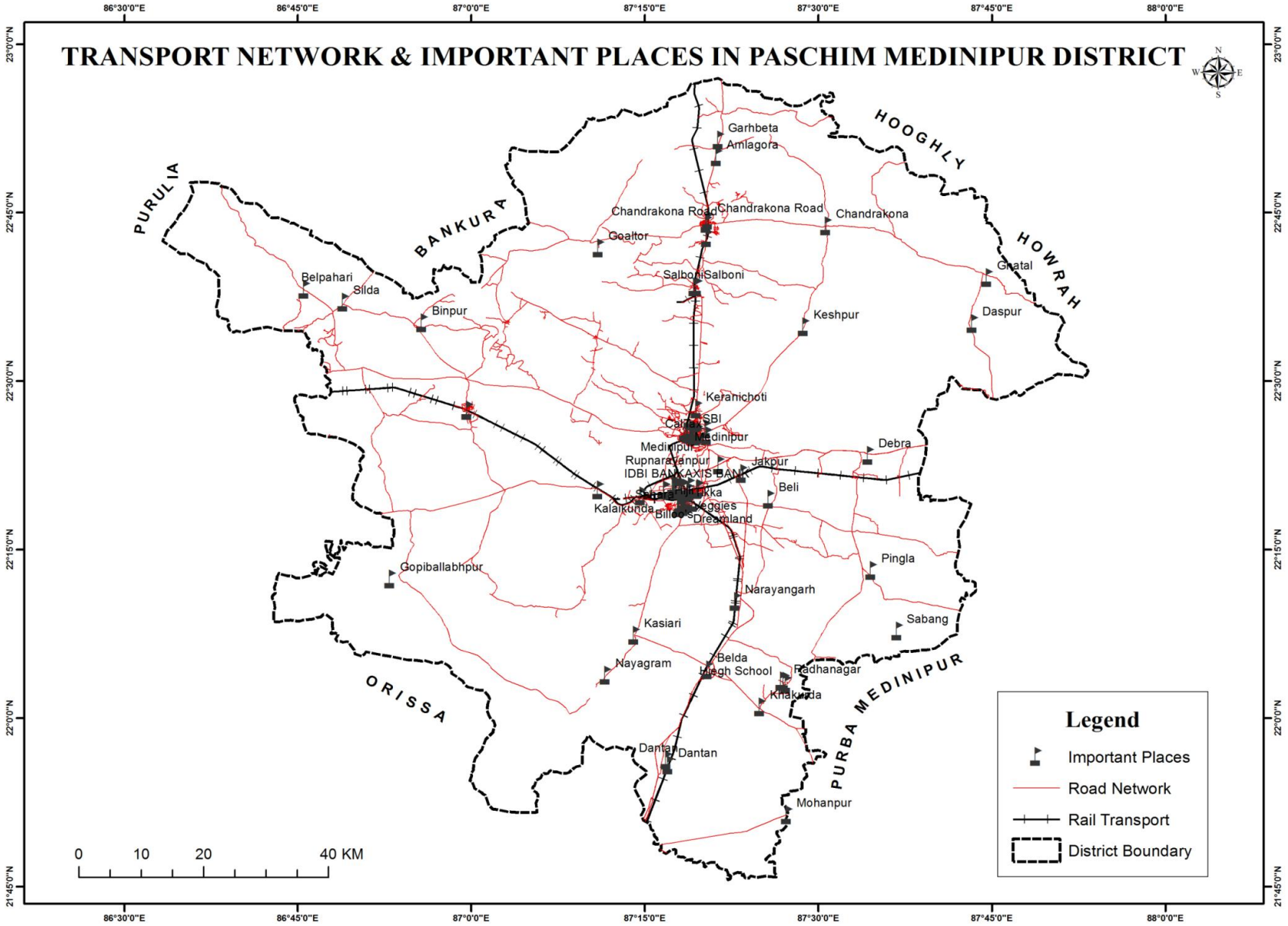


Fig 15: Transport network in the Community Development Blocks of Paschim Medinipur district

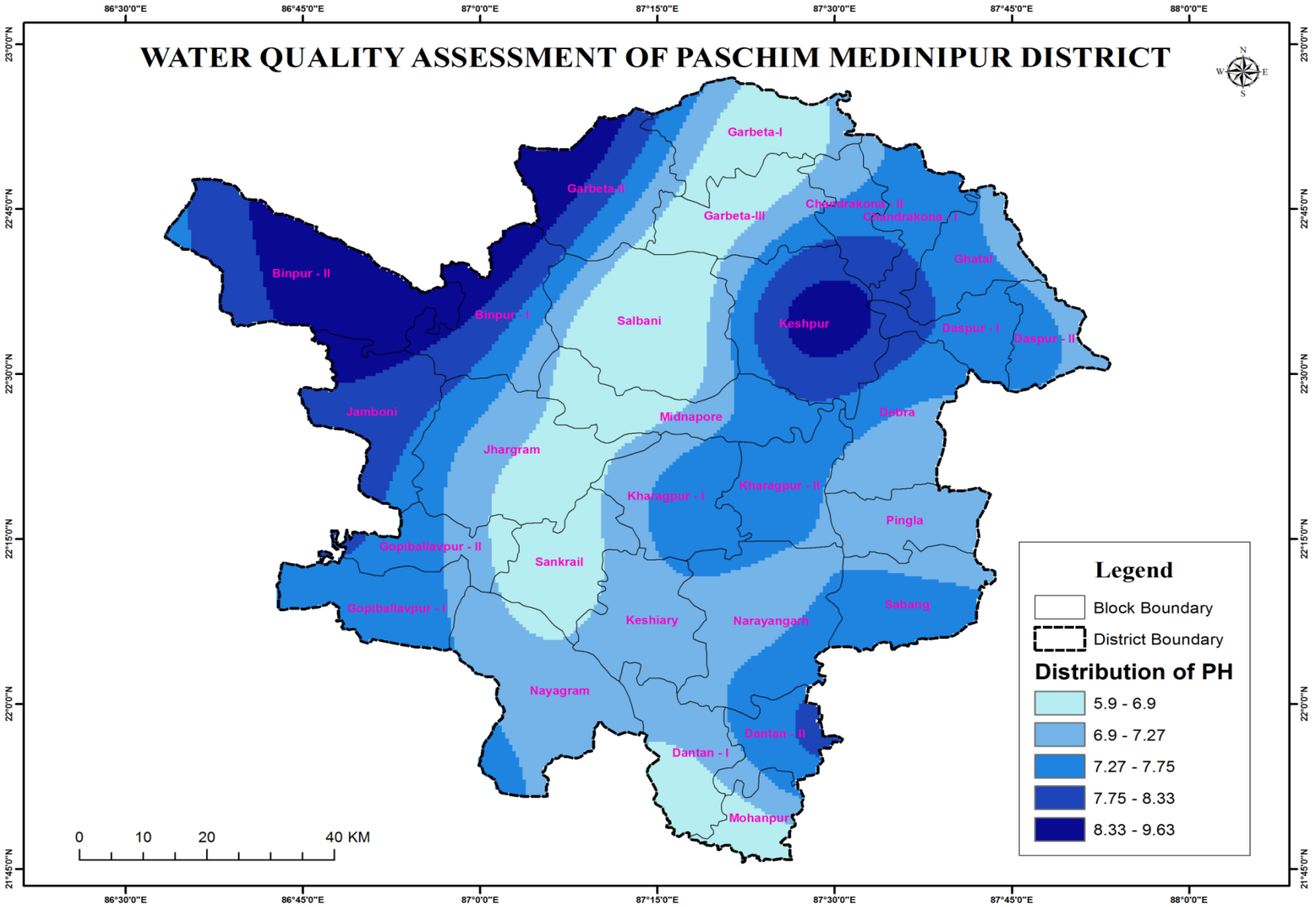


Fig 16: pH of aquatic bodies in different Community Development Blocks of Paschim Medinipur district

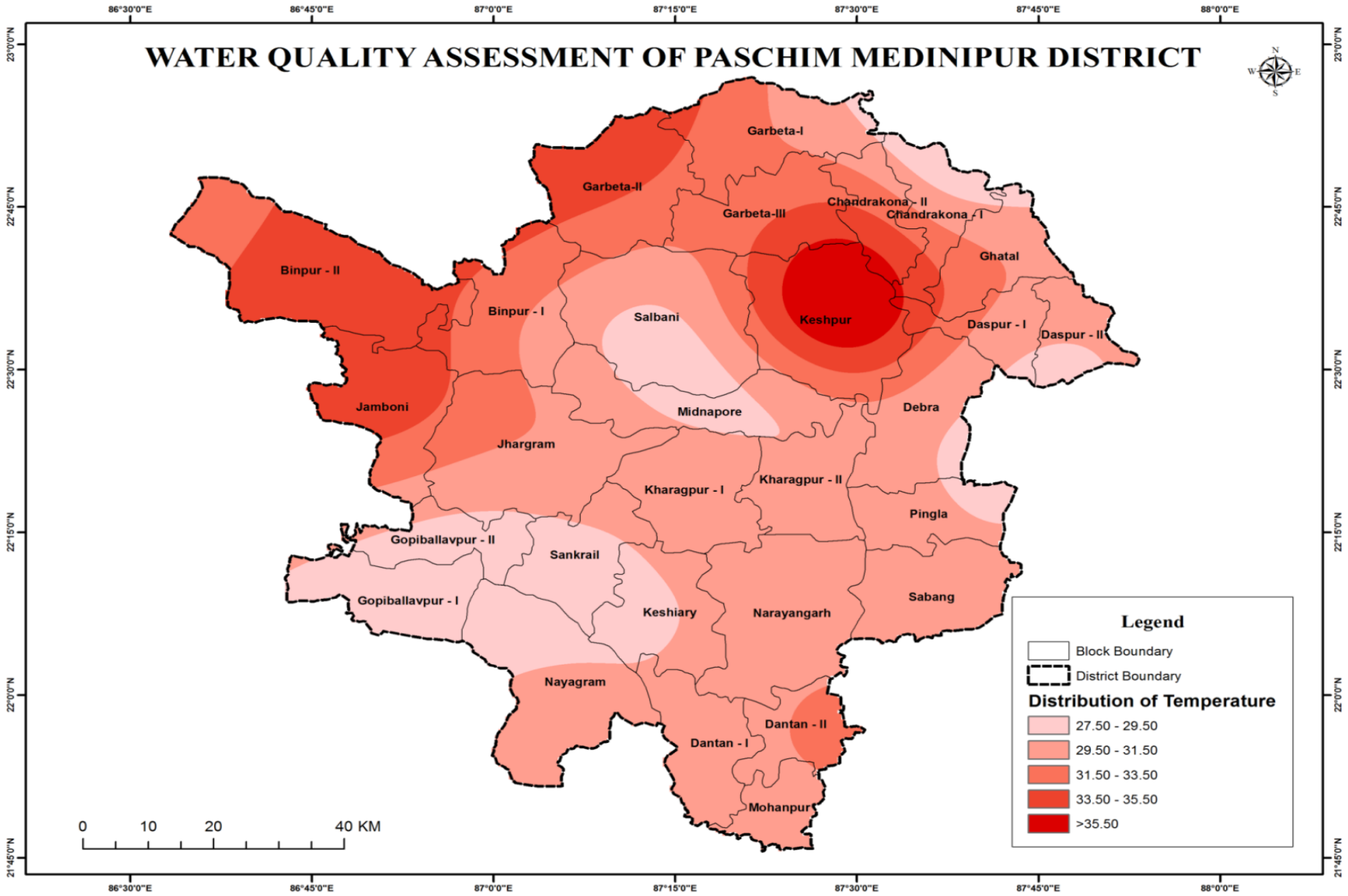


Fig 17: Temperature of aquatic bodies in different Community Development Blocks of Paschim Medinipur district

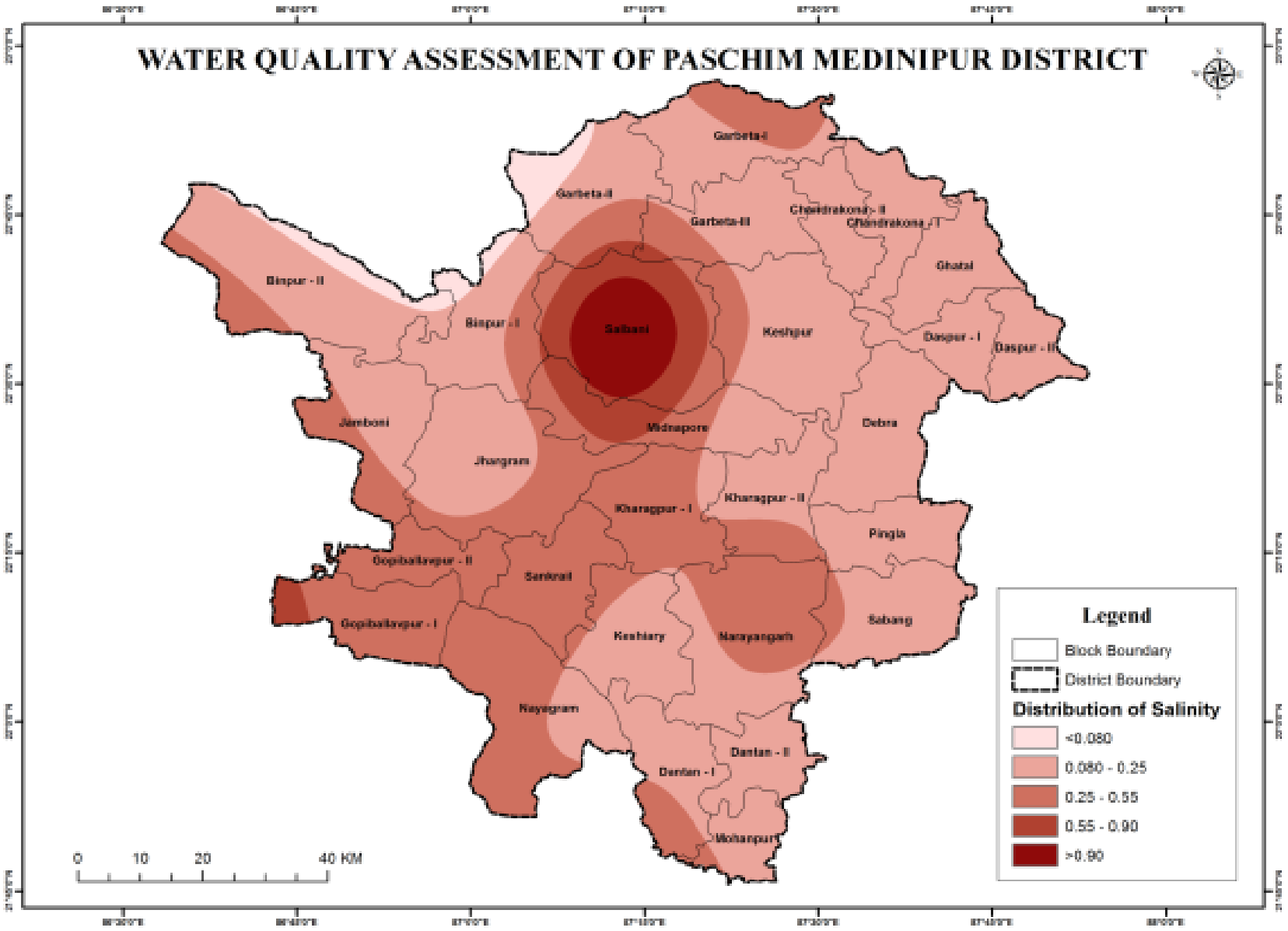


Fig 18: Salinity of aquatic bodies in different Community Development Blocks of Paschim Medinipur district

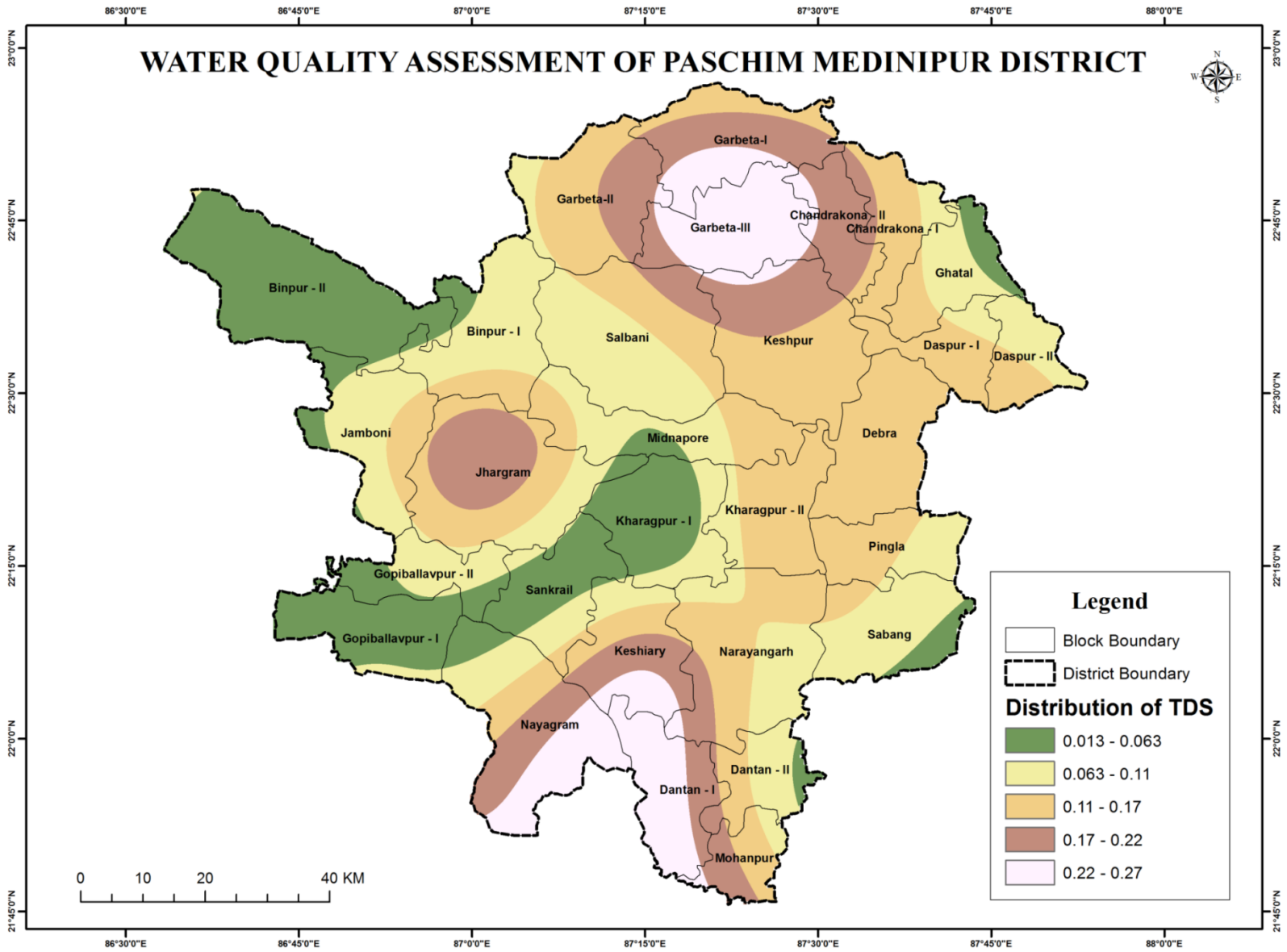


Fig 19: TDS of aquatic bodies in different Community Development Blocks of Paschim Medinipur district

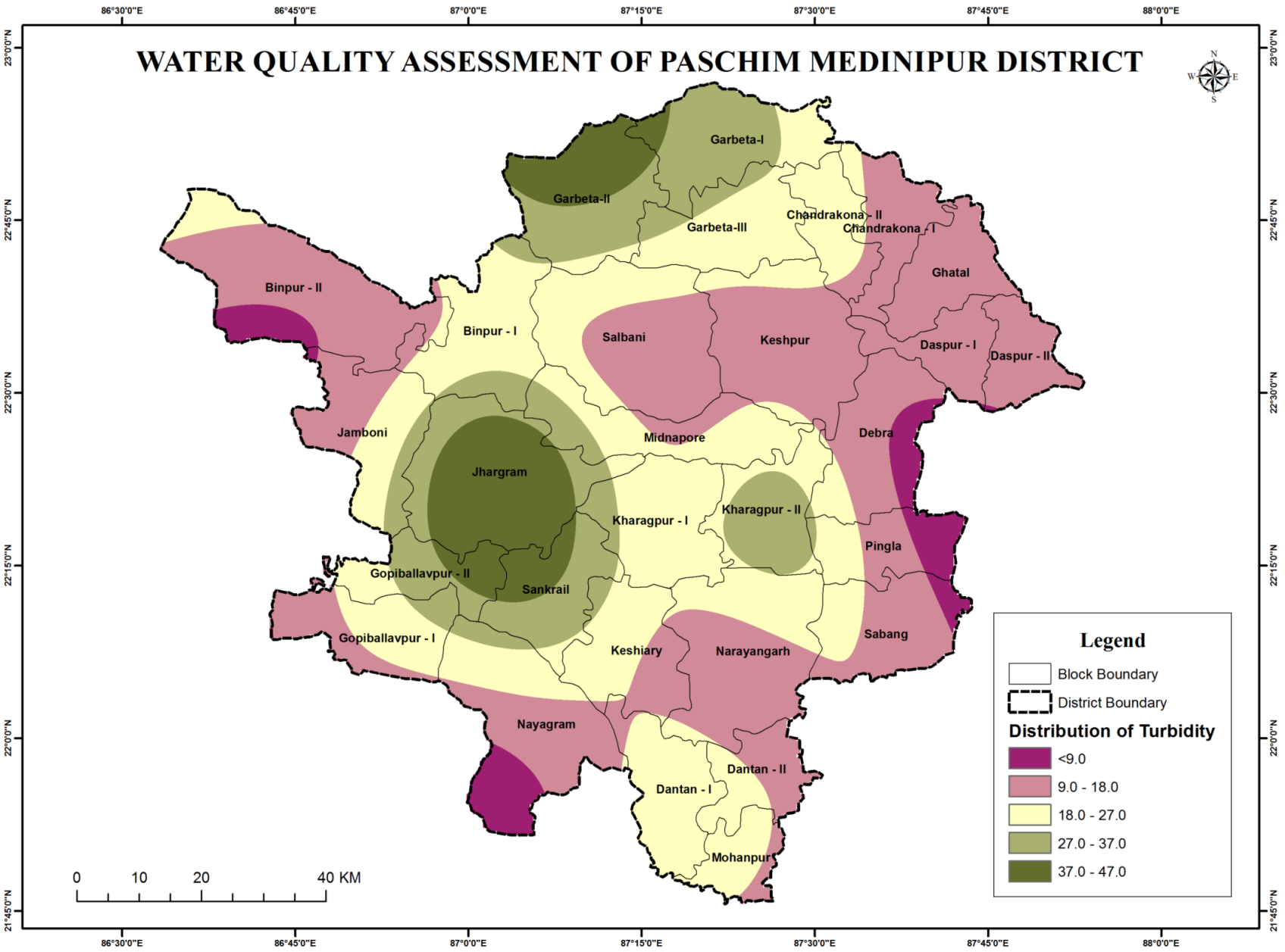


Fig 20: Turbidity of aquatic bodies in different Community Development Blocks of Paschim Medinipur district

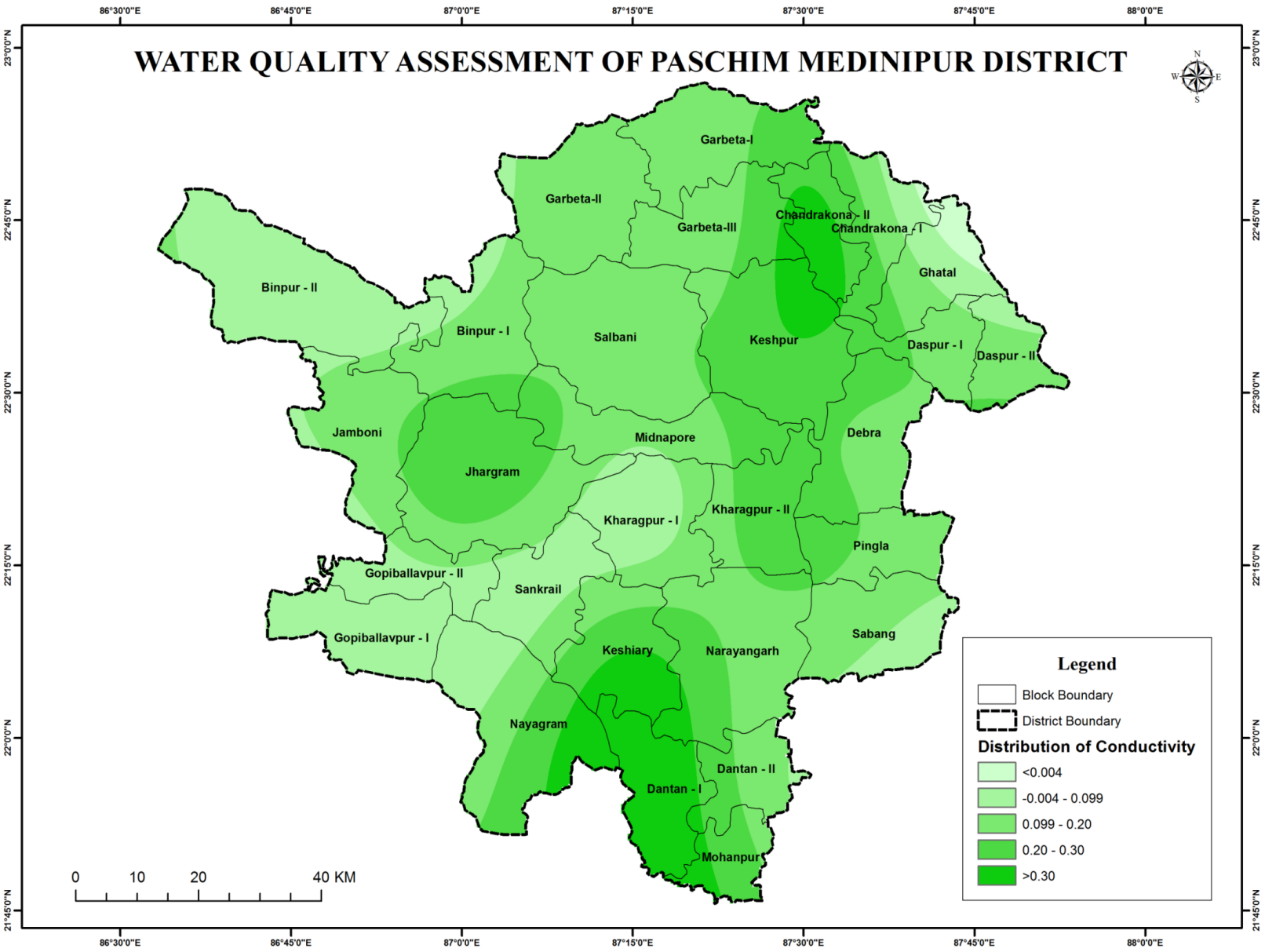


Fig 21: Conductivity of aquatic bodies in different Community Development Blocks of Paschim Medinipur district

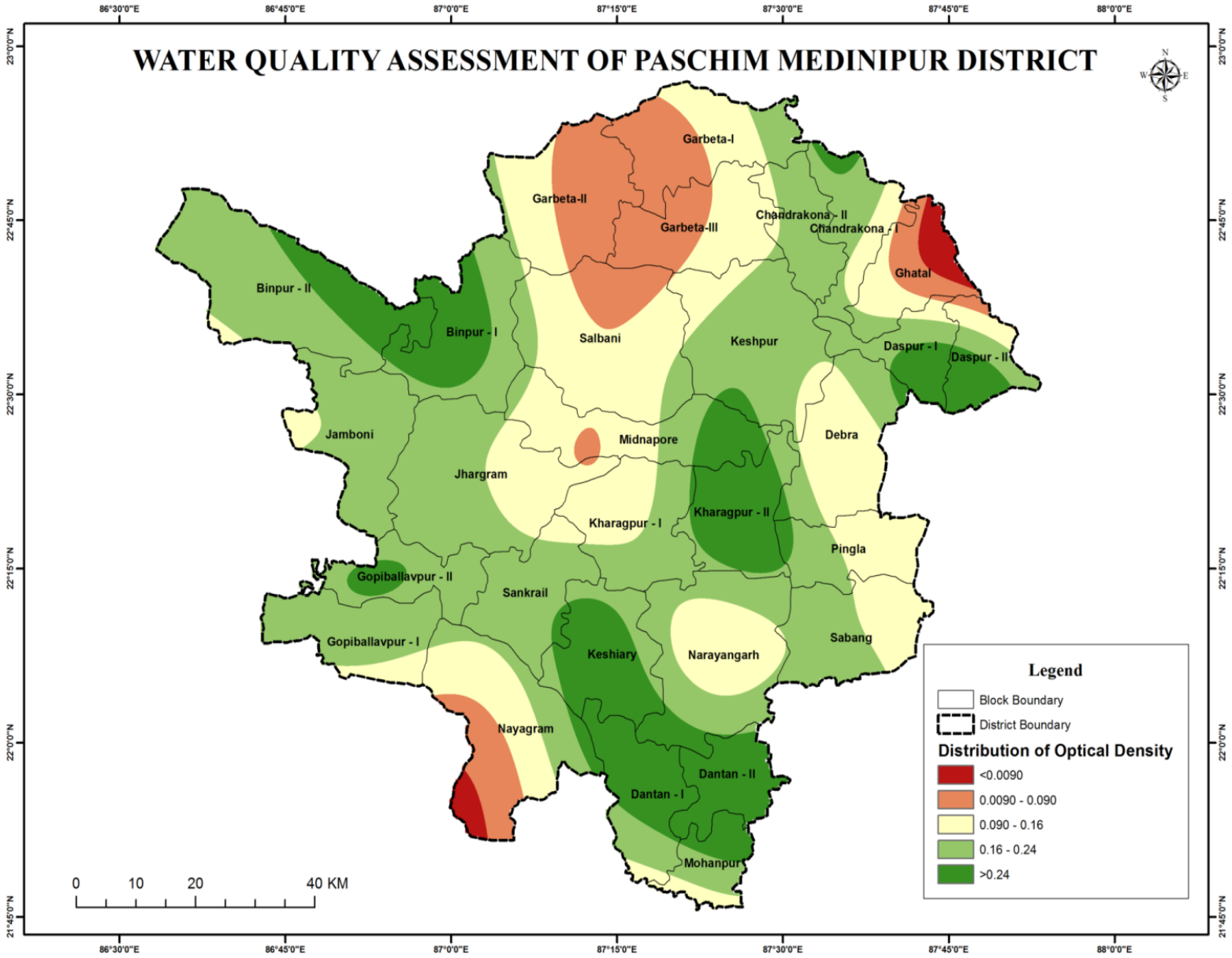


Fig 22: Optical density of aquatic bodies in different Community Development Blocks of Paschim Medinipur district

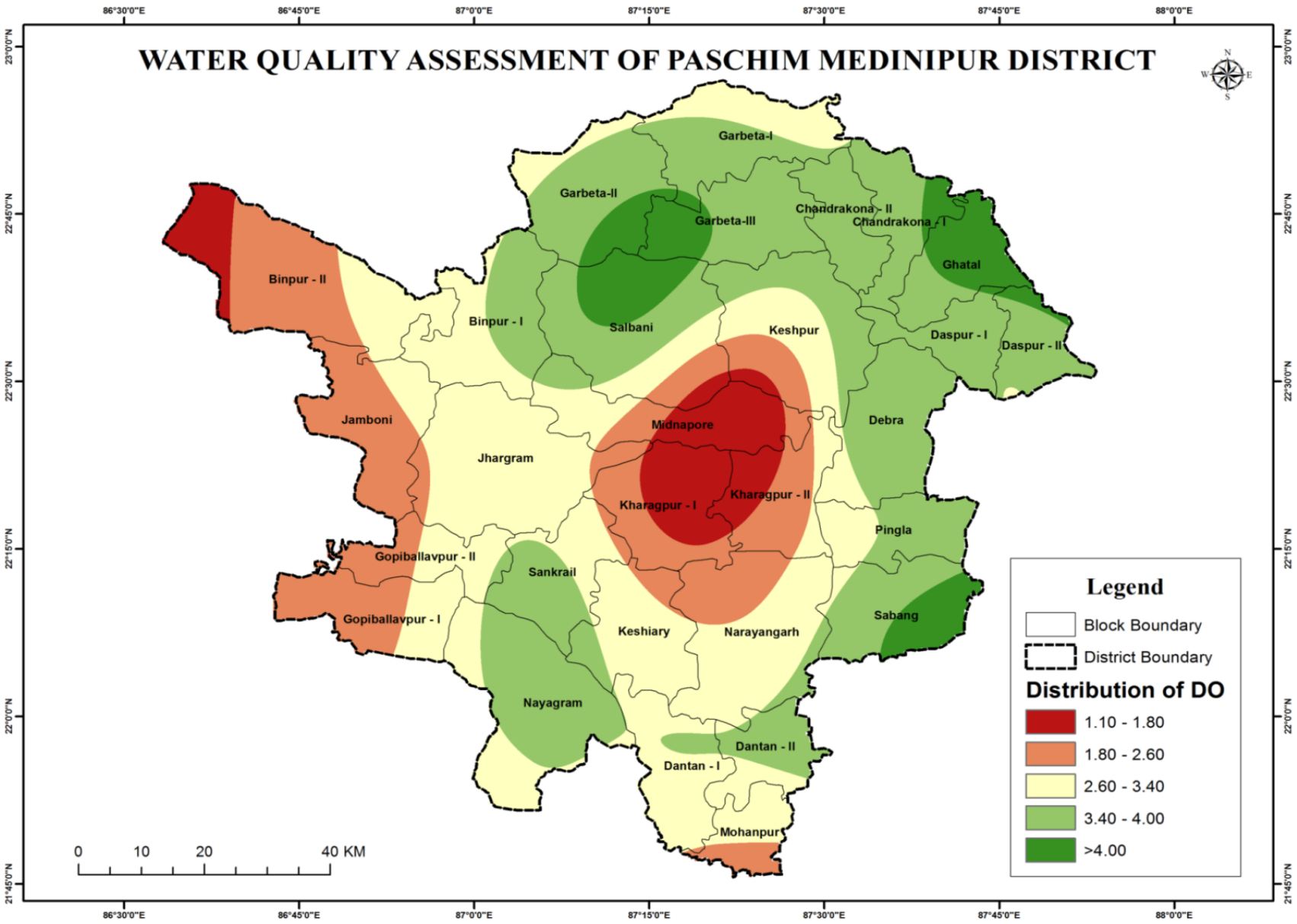


Fig 23: Dissolve Oxygen of aquatic bodies in different Community Development Blocks of Paschim Medinipur district

Hyporamphus affinis

Xenentodon cancila

Amblypharyngodon microlepis

Amblypharyngodon mola

Opsarius barna

Barilius vagra

Cabdio morar

Labeo catla

Cirrhinus mrigala

Cirrhinus reba

Ctenopharyngodon idella

Cyprinus carpio

Devario devario

Danio rerio

Esomus danricus

Hypophthalmicthys molitrix

Labeo bata

Labeo calbasu

Labeo rohita

Laubuka laubuca

Lepidocephalicthys guntea

Lepidocephalicthys thermalis

Osteobramma cotio cotio

Pethia conchonius

Pethia phutunio

Pethia ticto

Puntius chola

Puntius sophore

Puntius terio

Rasbora daniconius

Salmostoma bacaila

Salmophasia phulo

Systomus sarana

Aplocheilus panchax

Chitala chitala

Notopterus notopterus

Channa gachua

Channa marulius

Channa orientalis

Channa punctate

Channa striata

Anabas cobojius

Anabas testudineus

Badis badis

Chanda nama

Glossogobius giuris

Nandus nandus

Oreochromis mossambicus

Oreochromis niloticus

Parambassis baculis

Parambassis lala

Parambassis ranga

Trichogaster chuna

Trichogaster fasciata

Trichogaster lalius

Clarias batrachus

Clarias gariepinus

Eutropiichthys vacha

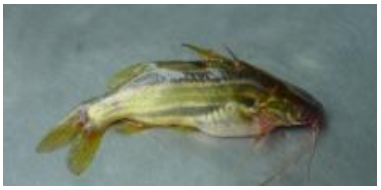
Heteropneustes fossilis

Mystus bleekeri

Mystus cavassius

Mystus gulio

Mystus tengara



Mystus vittatus

Pachypterus atherinoides

Ompok bimaculatus

Ompok pabda

Pangasius pangasius

Sperata aor

Wallago attu

Macrognathus aculeatus

Macrognathus aral

Macrognathus pancalus

Mastacembelus armatus

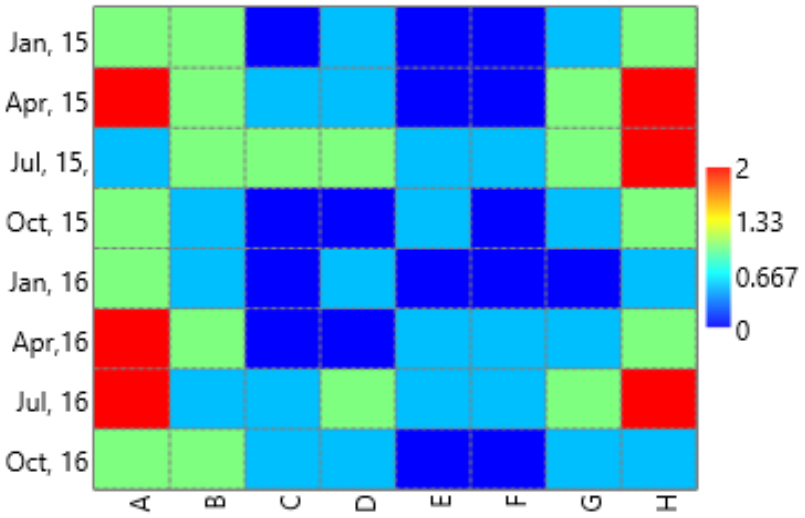
Monopterus cuchia

Piaractus brachypomus

Fig 24: Recorded freshwater finfish fauna of Paschim Medinipur district, West Bengal, India

Sl. No.	Scientific name	Symbol	IUCN (2018-1)
1	*Cyprinus carpio* (Linnaeus, 1758)	A	VU
2	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	B	NT
3	Chitala chitala (Hamilton, 1822)	C	NT
4	*Wallago attu* (Bloch & Schneider, 1801)	D	NT
5	*Ompok pabda* (Hamilton, 1822)	E	NT
6	*Ompok bimaculatus* (Bloch, 1794)	F	NT
7	*Parambassis lala* (Hamilton, 1822)	G	NT
8	*Oreochromis mossambicus* (Peters,1852)	H	NT

Table 09: Fishes with conservation priority



0-1=less, 1- <2=moderate and 2 or >2 is high.

Fig 25: Scatter plot matrix of the threatened fish species

Among the conservation priority species *Cyprinus carpio* (IUCN status VU) and *Oreochromis mossambicus* (IUCN status NT) is found mostly during pre-monsoon and early monsoon months like April,2015 to July,2015 and less in post monsoon months, whereas *Hypophthalmicthys molitrix* (IUCN status NT) is found in moderate amount during January, April and July and less

in October and January, *Chitala chitala* (IUCN status NT) is ranges from 0-1 that is less as per our record, *Wallago attu* (IUCN status NT) ranges from (IUCN status NT), *Ompok pabda* (IUCN status NT), *Ompok bimaculatus* (IUCN status NT), *Parambassis lala* (IUCN status NT) ranges from 0-1 that means these species are found less in this selected zone.

The Community development blocks Ghatal, Daspur-I, Daspur-II,Pingla, Sabang showed high fish diversity due to favourable hydrobiological parameters and avaialability of most number of perennial freshwater bodies. Moderate diversity seen in the blocks Chandrakona–I, Chandrakona-II, Keshpur, Kharagpur-II, Debra, Keshiary, Narayangarh, Dantan-I, Mohanpur, Binpur-I, Gopiballavpur-I, Gopiballavpur-II. Low diversity observed in the blocks like Garhbeta-I, Garhbeta-II, Garhbeta-III, Salbani, Midnapore, Kharagpur-I, Binpur-II, Jhargram, Jamboni, Sankrail, Nayagram, Dantan-II

Sl No.	COMMUNITY DEVELOPMENT BLOCK	WATER BODY AREA	LATITUDE /LONGITUDE
1	BINPUR I	JHATBANI	N22˚30.360'/ E87˚01.457'
2	BINPUR I	CHERRABANI	N22˚30.383'/ E87˚01.481'
3	BINPUR I	BALARAMPUR	N22˚30.736' / E87˚01.371'
4	BINPUR I	BAMAL	N22˚33.547' / E87˚02.917'
5	BINPUR I	KUMARKATA 1	N22˚33.145' / E87˚02.838'
6	BINPUR I	KUMARKATA 2	N22˚33.132' / E87˚03.021'
7	BINPUR I	KUMARKATA 3	N22˚33.200' / E87˚02.956'
8	BINPUR I	BARAKALA	N22˚31.217' / E87˚02.990'
9	BINPUR I	BHAUDI	N22˚32.399' / E87˚04.773'
10	BINPUR I	BOITA	N22˚29.563' / E87˚03.487'
11	BINPUR I	KHARISNALA	N22˚29.544' / E87˚03.803'
12	BINPUR I	KUNARPUR	N22˚29.571' / E87˚03.865'
13	BINPUR I	KANSAI BANK	N22˚29.632' / E87˚03.716'
14	BINPUR I	CHAMTYARA	N22˚33.917' / E87˚02.983'
15	BINPUR I	MALBANDHI	N22˚28.841' / E87˚06.715'
16	BINPUR I	GANAKKATI	N22˚28.655' / E87˚03.651'
17	BINPUR I	PURNAPANI	N22˚38.949' / E87˚02.516'

18	BINPUR I	PALASHBANI	N22˚29.905' / E87˚00.674'
19	BINPUR I	PINDRAKULI	N22˚29.811' / E87˚02.384'
20	BINPUR I	BARACHANDABILA	N22˚40.412' / E87˚02.713'
21	BINPUR I	BARAPIRRA	N22˚38.418' / E87˚02.214'
22	BINPUR-I	BHURSA 1	N22˚33.449' / E86˚57.234'
23	BINPUR-I	BHURSA 2	N22˚33.693' / E86˚56.945'
24	BINPUR-I	GOALDANGA	N22˚33.558' / E86˚56.743'
25	BINPUR-I	NANDALALPUR	N22˚32.489' / E86˚56.818'
26	GARHBETA II	GOALTORE 1	N22˚42.419' / E87˚10.473'
27	GARHBETA II	GOALTORE 2	N22˚42.384' / E87˚10.455'
28	GARHBETA II	GOALTORE 3	N22˚42.326' / E87˚10.476'
29	GARHBETA II	SIJUA	N22˚39.042' / E87˚11.205'
30	GARHBETA II	GORABARI	N22˚42.489' / E87˚09.774'
31	GOPIBALLAVPUR I	HATIBARI 1	N22˚12.900' / E86˚43.745'
32	GOPIBALLAVPUR I	HATIBARI 2	N22˚12.898' / E86˚43.797'
33	GOPIBALLAVPUR II	TEGHARI	N22˚14.460' / E86˚58.196'
34	GOPIBALLAVPUR II	HARKI	N22˚14.352' / E86˚58.314'
35	GOPIBALLAVPUR II	BELIABERAH BDO	N22˚16.341' / E86˚57.091'
36	GOPIBALLAVPUR II	BELIABERAH MARKET 1	N22˚16.262' / E86˚57.161'
37	GOPIBALLAVPUR II	ANDHARIA	N22˚15.982' / E86˚56.451'
38	GOPIBALLAVPUR II	DULUNG	N22˚18.554' / E86˚55.027'
39	GOPIBALLAVPUR II	FEKO	N22˚18.609' / E86˚55.125'
40	GOPIBALLAVPUR II	TALGRAM	N22˚16.571' / E86˚54.764'
41	GOPIBALLAVPUR II	SALBANI	N22˚16.273' / E86˚54.893'
42	GOPIBALLAVPUR II	KUTHIGHAT	N22˚13.433' / E86˚54.138'
43	GOPIBALLAVPUR II	AGARBANI	N22˚13.330' / E86˚58.641'
44	GOPIBALLAVPUR II	TAPSIA	N22˚15.664' / E86˚54.838'
45	JHARGRAM	AGAIBANI	N22˚18.498' / E86˚56.634'
46	JHARGRAM	AKHRASOL	N22˚25.242' / E87˚06.389'
47	JHARGRAM	LUHAMANDIA	N22˚28.751' / E87˚01.741'

48	JHARGRAM	CHANDRI	N22˚24.612' / E86˚57.269'
49	JHARGRAM	BAHARASULI	N22˚24.131' / E86˚57.664'
50	JHARGRAM	MEHRA BUNDH	N22˚27.295' / E86˚59.123'
51	JHARGRAM	CHHOTO BUNDH	N22˚27.334' / E86˚59.066'
52	JHARGRAM	AMDIHA	N22˚27.340' / E87˚03.397'
53	JHARGRAM	SIMLI	N22˚20.147' / E86˚59.390'
54	JHARGRAM	KANYADUBA	N22˚29.837' / E87˚00.399'
55	JHARGRAM	MADHUPUR	N22˚21.186' / E86˚58.219'
56	JHARGRAM	BALIBHASA	N22˚20.324' / E87˚07.262'
57	JHARGRAM	KISMAT BAGJHAPA	N22˚21.162' / E86˚58.122'
58	JHARGRAM	CHAMPSASOL	N22˚25.984' / E87˚05.015'
59	JHARGRAM	JAMSOLA	N22˚20.430' / E86˚55.527'
60	JHARGRAM	TULSIBANI	N22˚19.827' / E86˚55.508'
61	JHARGRAM	DHANSOL	N22˚21.957' / E86˚55.312'
62	JHARGRAM	MARAIKHUTI	N22˚19.209' / E86˚55.941'
63	JHARGRAM	CHATARPADA	N22˚20.944' / E86˚55.722'
64	JHARGRAM	PETBINDHI	N22˚21.160' / E86˚55.565'
65	JHARGRAM	SUKNIBASA	N22˚20.004' / E87˚08.423'
66	JHARGRAM	BALADMARA	N22˚19.822' / E87˚08.901'
67	JHARGRAM	CHUBKA	N22˚23.480' / E87˚12.003'
68	JHARGRAM	JALJALI	N22˚24.126' / E87˚07.210'
69	JHARGRAM	DHOBA DHOBIN 1	N22˚25.780' / E86˚57.553'
70	JHARGRAM	DHOBA DHOBIN 2	N22˚25.566' / E86˚57.348'
71	JHARGRAM	CHANDRI	N22˚24.633' / E86˚57.328'
72	JHARGRAM	GANAKKATA	N22˚27.669' / E87˚02.872'
73	JHARGRAM	CHUAPAL	N22˚09.544' / E87˚03.335'
74	JHARGRAM	CHUBKA	N22˚23.359' / E87˚11.648'
75	JHARGRAM	PAHARAJPUR	N22˚23.109' / E87˚10.819'
76	JHARGRAM	DEWANCHAWK	N22˚23.351' / E87˚11.690'
77	JHARGRAM	BHANGABANDH	N22˚26.271' / E87˚04.412'

78	JHARGRAM	TALMETAL	N22˚29.787' / E87˚01.736'
79	JHARGRAM	GANGADHARPUR	N22˚28.583' / E87˚02.686'
80	JHARGRAM	JABANIKATA	N22˚28.854' / E87˚02.515'
81	JHARGRAM	SHYAMCHAK	N22˚29.187' / E87˚02.797'
82	JHARGRAM	JAMIRA	N22˚22.384' / E86˚55.364'
83	JHARGRAM	PINDRA	N22˚21.957' / E86˚55.312'
84	JHARGRAM	JARALATA 1	N22˚26.533' / E86˚58.081'
85	JHARGRAM	JARALATA 2	N22˚26.514' / E86˚58.088'
86	JHARGRAM	JHATIBANDH	N22˚23.598' / E87˚07.530'
87	JHARGRAM	DHOBASOL	N22˚23.768' / E87˚07.637'
88	JHARGRAM	JITUSOL	N22˚21.926' / E87˚01.446'
89	JHARGRAM	BHARATPUR	N22˚27.893' / E86˚58.475'
90	JHARGRAM	SHALUKGERIA	N22˚28.090' / E86˚58.439'
91	JHARGRAM	KASHIA	N22˚26.024' / E86˚58.457'
92	JHARGRAM	DHARAMPUR	N22˚25.926' / E86˚58.441'
93	JHARGRAM	SEVAYATAN	N22˚28.444' / E87˚01.792'
94	JHARGRAM	KEUDI	N22˚28.638' / E87˚02.008'
95	JHARGRAM	KECHANDA 1	N22˚28.455' / E87˚01.814'
96	JHARGRAM	KECHANDA 2	N22˚28.611' / E87˚01.806'
97	JHARGRAM	KECHANDA 3	N22˚28.578' / E87˚01.850'
98	JHARGRAM	KECHANDA BANDH	N22˚28.220' / E87˚01.543'
99	JHARGRAM	MOHANPUR 1	N22˚28.904' / E87˚01.628'
100	JHARGRAM	MOHANPUR 2	N22˚28.923' / E87˚01.661'
101	JHARGRAM	LUHAMANDIA	N22˚28.765' / E87˚01.768'
102	JHARGRAM	KHALSEULI	N22˚23.581' / E87˚13.612'
103	JHARGRAM	BAR DHABANI	N22˚27.835' / E87˚02.396'
104	JHARGRAM	KISMAT DEBI	N22˚18.953' / E86˚59.791'
105	JHARGRAM	KHAYER BANI	N22˚18.541' / E86˚59.864'
106	JHARGRAM	CHHOTO PARULIA	N22˚17.946' / E86˚59.862'
107	JHARGRAM	BALIBHASA	N22˚21.143' / E87˚06.861'

108	JHARGRAM	SINGPUR	N22˚28.462' / E87˚03.293'
109	JHARGRAM	MOHANPUR	N22˚28.906' / E87˚01.484'
110	JHARGRAM	KAMARBANDI	N22˚22.128' / E87˚02.257'
111	JHARGRAM	LODHASULI	N22˚19.837' / E87˚03.134'
112	JHARGRAM	SANKBANDI	N22˚22.425' / E87˚08.315'
113	JHARGRAM	JAYNAGAR	N22˚29.499' / E87˚01.852'
114	JHARGRAM	MATIANA 1	N22˚29.451' / E87˚02.223'
115	JHARGRAM	MATIANA 2	N22˚29.451' / E87˚02.223'
116	JHARGRAM	SALCHATRI	N22˚29.548' / E87˚04.317'
117	JHARGRAM	SALBANI	N22˚27.211' / E87˚05.755'
118	JHARGRAM	KHAYRAKATA	N22˚27.324' / E87˚05.655'
119	JHARGRAM	ELANI	N22˚27.588' / E87˚05.647'
120	JHARGRAM	KHASJUNGLE 1	N22˚22.792' / E86˚59.714'
121	JHARGRAM	KHASJUNGLE 2	N22˚22.796' / E86˚59.678'
122	JHARGRAM	GHATIDUBA	N22˚22.396' / E86˚59.520'
123	JHARGRAM	BARPANI	N22˚27.446' / E87˚04.125'
124	JHARGRAM	CHAK PINDRASOL	N22˚17.160' / E86˚58.968'
125	JHARGRAM	PATASHIMUL	N22˚16.998' / E86˚58.682'
126	JHARGRAM	JORAKEUNDI	N22˚29.860' / E87˚01.723'
127	JHARGRAM	BANKATI	N22˚25.023' / E86˚57.696'
128	JHARGRAM	SARALYA	N22˚28.890' / E87˚01.677'
129	JHARGRAM	JARKASULI	N22˚24.300' / E87˚07.487'
130	JHARGRAM	GAIGHATA	N22˚28.035' / E87˚00.413'
131	JHARGRAM	DHOBA DHOBIN	N22˚25.612' / E86˚57.591'
132	JHARGRAM	RAMCHANDRAPUR	N22˚28.762' / E86˚58.731'
133	JHARGRAM	OLD JHARGRAM 1	N22˚25.962' / E87˚00.036'
134	JHARGRAM	OLD JHARGRAM 2	N22˚26.031' / E87˚00.005'
135	JHARGRAM	MOHANPUR 1	N22˚28.898' / E87˚01.413'
136	JHARGRAM	MOHANPUR 2	N22˚28.950' / E87˚01.340'
137	JHARGRAM	BIRIHANDI 1	N22˚20.622' / E86˚59.052'

138	JHARGRAM	BIRIHANDI 2	N22˚20.625' / E86˚59.070'
139	JHARGRAM	KAYEMA	N22˚22.855' / E87˚01.821'
140	JHARGRAM	JARALAT	N22˚26.751' / E86˚58.259'
141	JHARGRAM	SUABASA	N22˚26.879' / E86˚58.347'
142	JHARGRAM	TENGYA	N22˚26.331' / E86˚56.722'
143	JHARGRAM	TANGA	N22˚26.341' / E86˚56.464'
144	JHARGRAM	JAMBANI	N22˚26.367' / E86˚56.304'
145	MIDNAPUR SADAR	KHARIKABAD	N22˚28.255' / E87˚08.005'
146	MIDNAPUR SADAR	JAMDHARA	N22˚28.791' / E87˚09.140'
147	MIDNAPUR SADAR	DHERUA	N22˚29.054' / E87˚06.438'
148	MIDNAPUR SADAR	SUNDRAGURI	N22˚29.504' / E87˚04.355'
149	MIDNAPUR SADAR	SALCHATRI	N22˚29.494' / E87˚04.666'
150	MIDNAPUR SADAR	TIKARAMPUR	N22˚29.563' / E87˚04.863'
151	MIDNAPUR SADAR	HABIBPUR	N22˚25.654' / E87˚20.650'
152	MIDNAPUR SADAR	PANCHKHURI 1	N22˚26.866' / E87˚22.708'
153	MIDNAPUR SADAR	PANCHKHURI 2	N22˚26.856' / E87˚22.737'
154	NAYAGRAM	NAYAGRAM	N22˚02.918' / E87˚10.891'
155	NAYAGRAM	BHASRA	N22˚02.951' / E87˚10.878'
156	SALBONI	KANKSOL	N22˚33.540' / E87˚10.829'
157	SALBONI	DAKHINSOL	N22˚32.534' / E87˚12.686'
158	SALBONI	DHANSOL	N22˚32.936' / E87˚12.832'
159	SALBONI	SHANKHABHANGA	N22˚40.753' / E87˚10.509'
160	SALBONI	KANPUR	N22˚15.824' / E86˚55.402'
161	SALBONI	GARIGAN	N22˚15.897' / E86˚55.779'
162	SALBONI	JANGALKHAS	N22˚39.658' / E87˚06.275'
163	SALBONI	KALAIMURI	N22˚39.565' / E87˚06.255'
164	SALBONI	SHALUKA	N22˚41.486' / E87˚06.624'
165	SALBONI	BINDUKATA	N22˚29.686' / E87˚01.133'
166	SALBONI	BANDGARA	N22˚34.652' / E87˚11.072'
167	SALBONI	KADASOL	N22°42.350' / E87° 7.596'

168	JHARGRAM	MOHANPUR	N22˚28.945' / E87˚01.343'
169	JHARGRAM	MOHANPUR	N22°28.928' / E87° 1.636'
170	JHARGRAM	SALPATRA	N22˚25.028' / E87˚06.601'
171	MIDNAPUR SADAR	JAMIRARA	N22˚27.609' / E87˚23.479'
172	KESHPUR	KHARIKA	N22˚31.052' / E87˚25.661'
173	KESHPUR	KANAKPAT	N22˚35.806' / E87˚29.321'
174	KESHPUR	ASHRAFPUR 1	N22˚36.554' / E87˚29.161'
175	KESHPUR	ASHRAFPUR 2	N22°36.483' / E87°29.215'
176	CHANDRAKONA-II	RADHANAGAR	N22°41.969' / E87°30.717'
177	CHANDRAKONA-II	NATA GERYA	N22°39.318' / E87°30.963'
178	CHANDRAKONA-II	KHALAKPUR	N22˚39.487' / E87˚31.127'
179	KESHPUR	SATDUBI	N22˚39.739' / E87˚30.895'
180	KESHPUR	MUGBOSAN 1	N22°35.674' / E87°28.897'
181	KESHPUR	MUGBOSAN 2	N22˚35.745' / E87˚29.056'
182	KESHPUR	MUGBOSAN 3	N22˚35.737' / E87˚29.152'
183	KESHPUR	MUGBOSAN 4	N22˚35.683' / E87˚28.737'
184	KESHPUR	KOKAPUR	N22°38.349' / E87°29.116'
185	KESHPUR	MAKULCHAK	N22°38.285' / E87°29.654'
186	KESHPUR	KHARIKA	N22˚30.699' / E87˚25.687'
187	KESHPUR	JAORA PAIKAN	N22˚31.936' / E87˚25.307'
188	KESHPUR	KOKAPUR	N22˚38.436' / E87˚29.228'
189	MIDNAPORE SADAR	RAINCHAK	N22˚29.062' / E87˚25.005'
190	CHANDRAKONA-I	GACH SITALA	N22°43.725' / E87°30.391'
191	KESHPUR	SONA DIHA	N22˚32.078' / E87˚26.403'
192	MIDNAPUR SADAR	RAINCHAK	N22˚29.233' / E87˚24.918'
193	KESHPUR	JIA GERYA	N22˚36.278' / E87˚29.894'
194	KESHPUR	AMRITPUR	N22˚35.954' / E87˚29.736'
195	CHANDRAKONA-I	GAMARIA 1	N22˚33.271' / E87˚26.223'
196	CHANDRAKONA-I	GAMARIA 2	N22˚33.314' / E87˚26.609'
197	GARHBETA-III	GUYADAHA	N22°44.298' / E87°24.012'

198	CHANDRAKONA-II	PANCHKHURI 1	N22˚41.162' / E87˚30.775'
199	CHANDRAKONA-II	PANCHKHURI 2	N22˚40.915' / E87˚30.801'
200	KESHPUR	MUKTICHAK	N22˚31.510' / E87˚26.058'
201	MIDNAPUR SADAR	BHADUTALA	N22˚27.948' / E87˚19.491'
202	SALBANI	KUTURIA	N22˚28.531' / E87˚19.525'
203	KESHPUR	PIPURDA	N22˚31.229' / E87˚25.768'
204	CHANDRAKONA-I	CHANDRAKONA	N22˚43.794' / E87˚30.865'
205	MIDNAPUR SADAR	BHADUTALA	N22°26.320' / E87°22.105'
206	KESHPUR	ICHHAIPUR	N22˚34.580' / E87˚29.324'
207	KESHPUR	NERADEUL	N22˚38.332' / E87˚29.968'
208	KESHPUR	KESHPUR	N22˚33.336' / E87˚27.465'
209	GARHBETA-I	KHAYERBANI	N22˚18.526' / E86˚59.860'
210	JHARGRAM	SONAMUI	N22˚19.939' / E86˚57.652'
211	JHARGRAM	MOHANPUR	N22˚19.143' / E87˚00.835'
212	JHARGRAM	JAMBEDYA	N22˚19.129' / E87˚00.531'
213	JHARGRAM	DHOBI JANGAL	N22˚19.207' / E87˚01.462'
214	JHARGRAM	KHAS JANGAL	N22˚19.403' / E87˚01.496'
215	JHARGRAM	DHOBI JANGAL	N22˚19.211' / E87˚01.454'
216	JHARGRAM	CHANDIPUR	N22˚21.706' / E87˚02.984'
217	JHARGRAM	BIRIHANDI	N22˚20.904' / E86˚58.287'
218	JHARGRAM	JANGAL KHAS	N22˚17.444' / E86˚59.539'
219	JHARGRAM	KALAJHARIA	N22˚18.377' / E86˚56.870'
220	JHARGRAM	DAKSHIN SOL	N22˚27.261' / E87˚02.348'
221	JHARGRAM	MATANSOL	N22˚19.194' / E86˚57.297'
222	BINPUR-I	RAGHUNATHPUR	N22°34.876' / E86°57.809'
223	BINPUR-I	BHANDARPUR	N22°34.910' / E86°56.973'
224	BINPUR-II	MALABATI	N22°35.954' / E86°51.864'
225	BINPUR-I	DHENGYA	N22°30.613' / E86°59.512'
226	BINPUR-I	DIBANKATI	N22°31.027' / E86°58.678'
227	BINPUR-I	CHALTAKANALI	N22°33.458' / E86°57.277'

228	BINPUR-I	BHURSA	N22°33.640' / E86°57.015'
229	BINPUR-I	BRINDABANPUR	N22°33.010' / E87°03.220'
230	MIDNAPUR SADAR	MALBANDI	N22°28.830' / E87°06.734'
231	BINPUR-I	BARAJAMDA	N22°34.522' / E86°58.575'
232	JAMBONI	KAPGARI	N22°31.122' / E86°52.446'
233	BINPUR-I	PARITA	N22°34.660' / E86°59.940'
234	JAMBONI	SARENGA	N22°22.457' / E86°51.985'
235	JAMBONI	NUNIA	N22°30.080' / E86°50.694'
236	MIDNAPUR SADAR	CHANDRA	N22°27.700' / E87°09.087'
237	BINPUR-II	PANCHPANIA	N22°35.389' / E86°54.688'
238	BINPUR-II	KANKO	N22°35.573' / E86°54.428'
239	BINPUR-I	HARIHARPUR	N22°36.327' / E87°02.469'
240	BINPUR-II	PATHRA	N22°35.626' / E86°53.949'
241	BINPUR-II	LOADI	N22°32.184' / E86°50.166'
242	JAMBONI	SHALBANI	N22°19.409' / E86°53.075'
243	MIDNAPUR SADAR	BELIA	N22°27.190' / E87°10.170'
244	JAMBONI	DUBRAJPUR	N22°31.026' / E86°49.049'
245	JHARGRAM	HATIBARI 1	N22°18.151' / E87°04.341'
246	SANKRAIL	HATIBARI 2	N22°18.119' / E87°04.405'
247	MIDNAPUR SADAR	DHERUA	N22°26.454' / E87°11.239'
248	BINPUR-II	MALABATI	N22°35.954' / E86°51.864'
249	GOPIBALLAVPUR-II	BELIABERAH	N22°16.278' / E86°57.167'
250	BINPUR-I	BARRA PINRA	N22°38.413' / E87° 2.228'
251	JAMBONI	KADADIHA	N22°32.926' / E86°48.396'
252	GOPIBALLAVPUR-II	SHANKRARI	N22°15.973' / E86°56.452'
253	GOPIBALLAVPUR-II	GARIGAN	N22°15.909' / E86°55.699'
254	GOPIBALLAVPUR-II	KANPUR	N22°15.793' / E86°55.368'
255	BINPUR-I	PURNAPANI	N22°38.952' / E87°02.516'
256	GOPIBALLAVPUR-II	NAKHRA	N22°15.121' / E86°57.759'
257	SANKRAIL	KARKATASOL	N22°15.450' / E87°04.706'

258	KHARAGPUR-I	CHARKABONI	N22°21.569' / E87°11.760'
259	BINPUR-II	SHYAMSUNDARPUR	N22°36.532' / E86°49.566'
260	GOPIBALLAVPUR-II	TEGHARI	N22°14.353' / E86°58.315'
261	GOPIBALLAVPUR-II	GOHALMARA	N22°14.086' / E87°00.078'
262	MIDNAPUR SADAR	SHALIKA	N22°25.591' / E87°13.763'
263	GOPIBALLAVPUR-II	JAHANPUR	N22°13.556' / E86°58.927'
264	BINPUR-II	PARUSALI	N22°37.676' / E86°49.550'
265	GOPIBALLAVPUR-I	JARA KUSUM	N22°14.048' / E86°54.959'
266	BINPUR-II	ORGONDA	N22°37.989' / E86°49.786'
267	SANKRAIL	BALIBHASA	N22°14.764' / E87°06.459'
268	KHARAGPUR-I	KALAIKUNDA	N22°19.410' / E87°12.191'
269	GOPIBALLAVPUR-II	KHUD MARAI	N22°12.622' / E87°01.500'

Table 10: Geolocation (Latitude & Longitude) of the survey points of the Community Development Blocks in Paschim Medinipur district, West Bengal, India.