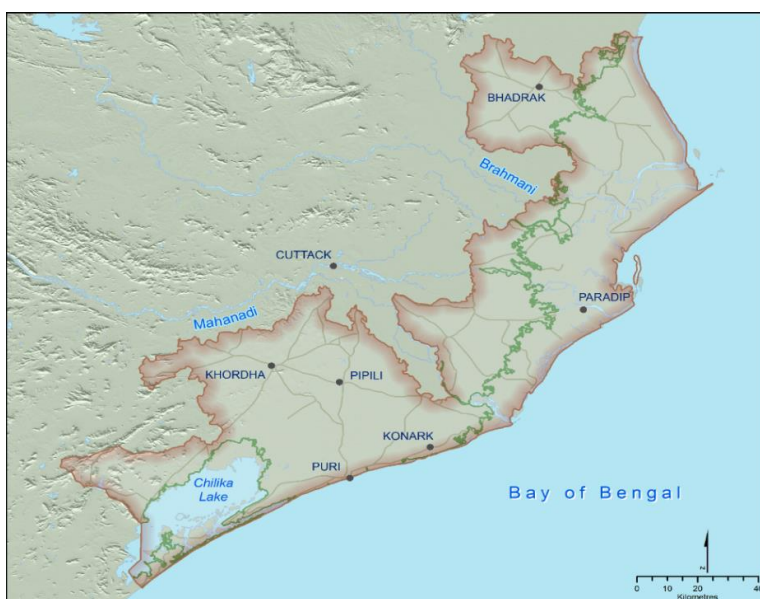1   **Supplementary Material**

2   **Figure S1:** Map of the Volta delta depicting the study site (region within the red line).

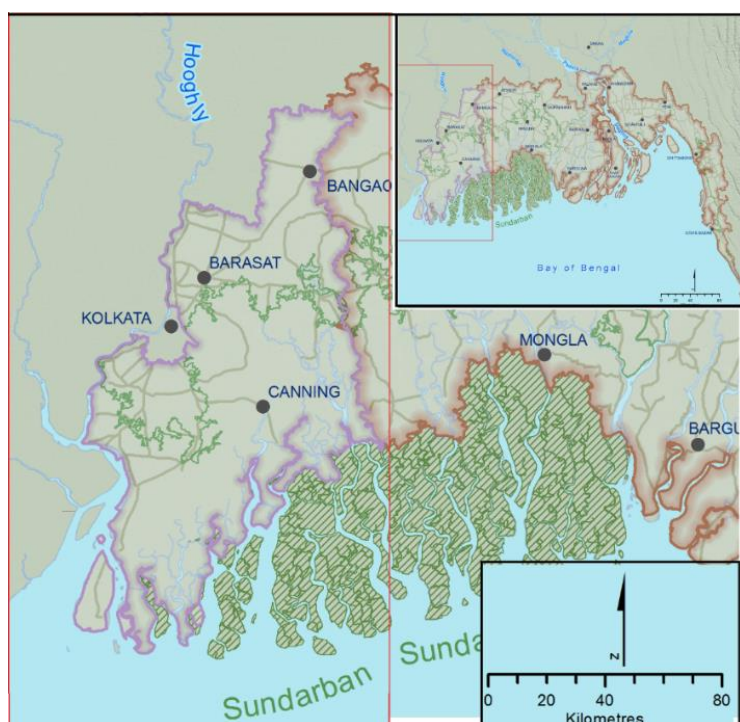3   Source: DECCMA-WP2 **(**2017**).**

4   **Figure S2:** Map of the Mahanadi delta depicting the study site (region within the red line).

5   Source: DECCMA-WP2 **(**2017**).**

6

7 **Figure S3**: Map of the Indian Bengal delta depicting the study site (region within the pink line on the left
8 hand side).

10 Source: DECCMA-WP2 **(**2017**).**

11 **Figure S4**: Map of the Ganges-Brahmaputra-Meghna Bangladeshi delta depicting the study site (region
12 within the red line).

14 Source: DECCMA-WP2 **(**2017**).**

1.1.“Climatic (rainfall, etc.) conditions of the study sites”

1.1.1. The Volta delta

In terms of climate, the Volta delta can be said to be lying within the wet semi-equatorial and the dry equatorial climatic zones. The climatic conditions of the Volta delta being influenced by the Southwest monsoon winds twice a year results in a double maximum rainfall pattern: the major rainy season falls between March and July while the minor one begins in August and ends in November. The annual precipitation averages vary between 146 mm and 750 mm. From November to February the north eastern harmattan winds[1] dominate, giving rise to a long dry season in the region (Awadzi *et al.*, 2008; Allersma and Tilsman, 1993). *One can observe from data on the Volta delta that rainfall levels are highly erratic. Rainfall levels are high in the major and minor raining seasons and low in the dry seasons. Between 2000-2013 for example, the maximum rainfall level observed was 639 mm and the minimum was 1 mm.* Temperatures in the Volta delta are quite high with mean monthly temperature of about 30°C in the warmest month, March, and about 26°C in the coldest month, August.

Climate is an important input to many human activities. Climate affects heating and cooling requirements, health, clothing and nutritional needs as well as recreational activities. Individuals across the world will prefer particular types of climate (see Rehdanz and Maddison, 2005), but in general in the studied coastal areas climate change is seen with fear, and already several effects such as coastal erosion, decrease of fish availability, etc. have been identified for the Volta delta. An assessment of the Volta Delta Shoreline Change can be seen e.g. in Appeaning Addo (2015) and proposals such as sea defence systems are often and increasingly discussed as climate change adaptation. Climate change adaptation, the process of building climate-resilient socioeconomic systems (see e.g. Vale, 2016 on how economics has recently addressed it), is then a major topic of discussion for the delta by the authorities and by the DECCMA project research.

1.1.2. The Mahanadi delta

The Mahanadi delta experiences a tropical with hot and humid monsoonal climate. The delta receives an average annual rainfall of 1,572 mm of which over 70% is precipitated during the southwest monsoon between middle of June to middle of October. The first week of June is the normal time of onset of monsoon over the delta. The amount of rainfall receives in January to February is less than 50 mm. The mean summer temperature of the region varies near 29°C and winter temperatures near 21°C. The Mahanadi river originates from Raipur district of Chhattisgarh and flows for about 851 km before it drains into the Bay of Bengal[2]. The annual discharge of Mahanadi River measured at Naraj is 48,691 million cubic metres.

We have seen that climate affects heating and cooling requirements, health, clothing and nutritional needs as well as recreational activities. As indicated above, in the studied coastal areas climate change is already affecting, notably the ecosystems, and people perceive environmental change. Climate change cannot be a single cause of mobility, but there is large agreement that it could reinforce existing drivers of migration (Black et al. 2011, Afifi and Warner 2008).

1.1.3. The Indian Bengal delta

The average temperature varies between 34°C (maximum) and 13.7°C (minimum). During pre-monsoon, the maximum temperature varies between 26°C and 40°C. The climate is pleasant during the winter and temperature rarely goes below 10°C. Relative humidity is over 80% from June to

---

[1] It refers to the dry and dusty northeasterly trade wind (which blows from the Sahara Desert over West Africa into the Gulf of Guinea) of the Harmattan season, which occurs in the West African subcontinent, between the end of November and the middle of March.{Duchin, 2015 #7772}

[2] Its main tributaries are the Seonath, the Jonk, the Hasdeo, the Mand, the ib, the Ong and the Tel. Other distributaries of Mahanadi include the Paika, Birupa, Chitroptala River, Genguti and Lun. Birupa later joins the Brahmani River at Khushnanagar.

September and over 75% from October to May. The climate of the delta is humid and can be categorized into pre-monsoon (February to May), monsoon (June to September), and post monsoon (October to January). The total annual rainfall is in the range of 1500-2000 mm. A large component of the annual rainfall (about 74% of the total) occurs during the Southwest monsoon period (June-September), which floods the delta. As can be witnessed from Figure 6, precipitation is also received during May (the tail-end of the summer) and in October (the beginning of the post-monsoon phase).

Two dominant prevailing winds during Southwest and Northeast monsoons lead to the South-westerly and the North-easterly wind. The normal maximum wind velocity is 16.7-50 km/h (April-June) and minimum wind velocity is 10.7-11.8 km/h (December-February). The prevalence of cyclonic storms can be witnessed during April, often associated with monsoon rainfall during July and August.

The Indian Sundarbans are experiencing the effects of climate change. Global warming, deglaciation of the Gangotri Glacier in the Himalayan ranges, Farakka barrage discharges and SLR have accelerated such changes over the last two decades. Observations of salinity over a period of 23 years (1990-2012) showed a significant long-term variation. Due to different geographical settings in the western, central and eastern sectors of the deltaic Sundarbans, the footprints of these changes manifested in different patterns and on different scales (Banerjee, 2013). As human populations expanded, the shortage of productive land in many developing countries led to clearing large areas of mangrove for agriculture and aquaculture production. Demands for timber (for charcoal, building, etc.) and coastal development space have been highly damaging. Mangrove forests in some areas were reduced to mere relicts of their former ranges because of human exploitation. The common perception of increased salinity is due to increased evaporation resulting in an increase in salinity, and by SLR, projected between 0.9 and 8.8 mm/year. The observed changes could be attributed to climate change consequences, human interventions and related phenomena. The ecological impact of such changes is an alarming signal for shoreline changes due to shifting of the mangroves inward (Banerjee, 2013).

1.1.4. The Bangladeshi Bengal delta

The BB delta lies mostly in the tropical wet climate zone. In general, maximum summer temperatures range between 38°C and 41°C and April is the hottest month in most parts of the country. January is the coolest month, when the average temperature for most of the country is 16-20 °C during the day and around 10°C at night. Heavy rainfall is characteristic for Bangladesh. Except for the relatively dry western region of Rajshahi, most parts of the country receive at least 2,300 mm of rainfall per year. Because of its location just south of the foothills of the Himalayas, where monsoon winds turn west and northwest, the region of Sylhet in north-eastern Bangladesh receives the greatest average precipitation. The average monthly rainfall patterns reveal that the dominant months in Bangladesh regarding the rainfall are May to September with peak in June-August (the monsoon season).

The average annual discharge of the three rivers into the Bay of Bengal is approximately 30,000 m^3/s. During flood seasons, the maximum discharge may exceed 80,000 m^3/s. From the analysis of historical data of Bahadurabad in Jamuna River from 1956 to 2007, it has been found that severe flooding may become more frequently soon (IWM, 2007). Another threat may come from climate change on the flow of these three rivers. If rainfall increases by 13% in the GBM basin and sea levels rise by 17 cm, the maximum flood level will increase by 37 cm in the Bahadurabad in Jamuna River which may create an additional 13,000 m^3/s flow in monsoon periods (IWM, 2007, 2008), and 12% to 16% increase in area will be inundated in the Ganges and Brahmaputra basin (IWM, 2007, 2008).

The cyclone of April 1991 induced a storm surge of 6–7.5 m height and caused nearly 150,000 deaths. The 1970 Bhola cyclone was less powerful, but is nonetheless the deadliest tropical cyclone on record, being estimated that between 300,000 and 500,000 people lost their lives. To reduce loss of lives and property, Bangladesh focuses on the development of flood forecasting and warning systems. But climate change may enhance these problems due to increase in precipitation and SLR. Intensity and frequency of cyclonic storm is expected to increase due to climate change, which will

108 aggravate the cyclonic flood also. Vulnerability of Bangladesh's agriculture to climate change is also
109 evident, and farm-level adaptation to climate change is being studied, e.g. on rice farmers' preferred
110 adaptation strategies, perceived barriers, and policy implications (Alauddin amd Sarker, 2014). Also
111 among other threats, fisheries in the southwest coastal region of Bangladesh will face threats because
112 of climate change, notably adverse impacts from increased aquatic salinity caused by SLR, which
113 may have an especially negative impact on poor households in the region (Dasgupta et al., 2017).
114

115 **Table S1.** List of the 57 GTAP sectors

116 **(https://www.gtap.agecon.purdue.edu/databases/contribute/detailedsector.asp)**

Number	Code	Description
1	Pdr	Paddy Rice: rice, husked and unhusked
2	Wht	Wheat: wheat and meslin
3	Gro	Other Grains: maize (corn), barley, rye, oats, other cereals
4	v_f	Veg & Fruit : vegetables, fruit vegetables, fruit and nuts, potatoes, cassava, truffles,
5	Osd	Oil Seeds: oil seeds and oleaginous fruit; soy beans, copra
6	c_b	Cane & Beet: sugar cane and sugar beet
7	Pfb	Plant Fibres: cotton, flax, hemp, sisal and other raw vegetable materials used in textiles
8	Ocr	Other Crops: live plants; cut flowers and flower buds; flower seeds and fruit seeds; vegetable seeds, beverage and spice crops, unmanufactured tobacco, cereal straw and husks, unprepared, whether or not chopped, ground, pressed or in the form of pellets; swedes, mangolds, fodder roots, hay, lucerne (alfalfa), clover, sainfoin, forage kale, lupines, vetches and similar forage products, whether or not in the form of pellets, plants and parts of plants used primarily in perfumery, in pharmacy, or for insecticidal, fungicidal or similar purposes, sugar beet seed and seeds of forage plants, other raw vegetable materials
9	Ctl	Cattle: cattle, sheep, goats, horses, asses, mules, and hinnies; and semen thereof
10	oap	Other Animal Products: swine, poultry and other live animals; eggs, in shell (fresh or cooked), natural honey, snails (fresh or preserved) except sea snails; frogs' legs, edible products of animal origin n.e.c., hides, skins and furskins, raw, insect waxes and spermaceti, whether or not refined or coloured
11	rmk	Raw milk
12	wol	Wool: wool, silk, and other raw animal materials used in textile
13	frs	Forestry: forestry, logging and related service activities
14	fsh	Fishing: hunting, trapping and game propagation including related service activities, fishing, fish farms; service activities incidental to fishing
15	coa	Coal: mining and agglomeration of hard coal, lignite and peat
16	oil	Oil: extraction of crude petroleum and natural gas (part), service activities incidental to oil and gas extraction excluding surveying (part)
17	gas	Gas: extraction of crude petroleum and natural gas (part), service activities incidental to oil and gas extraction excluding surveying (part)
18	omn	Other Mining: mining of metal ores, uranium, gems. other mining and quarrying
19	cmt	Cattle Meat: fresh or chilled meat and edible offal of cattle, sheep, goats, horses, asses, mules, and hinnies. raw fats or grease from any animal or bird.
20	omt	Other Meat: pig meat and offal. preserves and preparations of meat, meat offal or blood, flours, meals and pellets of meat or inedible meat offal; greaves
21	vol	Vegetable Oils: crude and refined oils of soya-bean, maize (corn),olive, sesame, ground-nut, olive, sunflower-seed, safflower, cotton-seed, rape, colza and canola, mustard, coconut palm, palm kernel, castor, tung jojoba, babassu and linseed, perhaps partly or wholly hydrogenated,inter-esterified, re-esterified or elaidinised. Also margarine and similar preparations, animal or vegetable waxes, fats and oils and their fractions, cotton linters, oil-cake and other solid residues resulting from the extraction of vegetable fats or oils; flours and meals of oil seeds or oleaginous fruits, except those of mustard; degras and other residues resulting from the treatment of fatty substances or animal or vegetable waxes.
22	mil	Milk: dairy products

23	pcr	Processed Rice: rice, semi- or wholly milled
24	sgr	Sugar
25	ofd	Other Food: prepared and preserved fish or vegetables, fruit juices and vegetable juices, prepared and preserved fruit and nuts, all cereal flours, groats, meal and pellets of wheat, cereal groats, meal and pellets n.e.c., other cereal grain products (including corn flakes), other vegetable flours and meals, mixes and doughs for the preparation of bakers' wares, starches and starch products; sugars and sugar syrups n.e.c., preparations used in animal feeding, bakery products, cocoa, chocolate and sugar confectionery, macaroni, noodles, couscous and similar farinaceous products, food products n.e.c.
26	b_t	Beverages and Tobacco products
27	tex	Textiles: textiles and man-made fibres
28	wap	Wearing Apparel: Clothing, dressing and dyeing of fur
29	lea	Leather: tanning and dressing of leather; luggage, handbags, saddlery, harness and footwear
30	lum	Lumber: wood and products of wood and cork, except furniture; articles of straw and plaiting materials
31	ppp	Paper & Paper Products: includes publishing, printing and reproduction of recorded media
32	p_c	Petroleum & Coke: coke oven products, refined petroleum products, processing of nuclear fuel
33	crp	Chemical Rubber Products: basic chemicals, other chemical products, rubber and plastics products
34	nmm	Non-Metallic Minerals: cement, plaster, lime, gravel, concrete
35	i_s	Iron & Steel: basic production and casting
36	nfm	Non-Ferrous Metals: production and casting of copper, aluminium, zinc, lead, gold, and silver
37	fmp	Fabricated Metal Products: Sheet metal products, but not machinery and equipment
38	mvh	Motor Motor vehicles and parts: cars, lorries, trailers and semi-trailers
39	otn	Other Transport Equipment: Manufacture of other transport equipment
40	ele	Electronic Equipment: office, accounting and computing machinery, radio, television and communication equipment and apparatus
41	ome	Other Machinery & Equipment: electrical machinery and apparatus n.e.c., medical, precision and optical instruments, watches and clocks
42	omf	Other Manufacturing: includes recycling
43	ely	Electricity: production, collection and distribution
44	gdt	Gas Distribution: distribution of gaseous fuels through mains; steam and hot water supply
45	wtr	Water: collection, purification and distribution
46	cns	Construction: building houses factories offices and roads
47	trd	Trade: all retail sales; wholesale trade and commission trade; hotels and restaurants; repairs of motor vehicles and personal and household goods; retail sale of automotive fuel
48	otp	Other Transport: road, rail; pipelines, auxiliary transport activities; travel agencies
49	wtp	Water transport
50	atp	Air transport
51	cmn	Communications: post and telecommunications
52	ofi	Other Financial Intermediation: includes auxiliary activities but not insurance and pension funding (see next)
53	isr	Insurance: includes pension funding, except compulsory social security
54	obs	Other Business Services: real estate, renting and business activities
55	ros	Recreation & Other Services: recreational, cultural and sporting activities, other service activities; private households with employed persons (servants)
56	osg	Other Services (Government): public administration and defense; compulsory social security, education, health and social work, sewage and refuse disposal, sanitation and similar activities, activities of membership organizations n.e.c., extra-territorial organizations and bodies
57	dwe	Dwellings: ownership of dwellings (imputed rents of houses occupied by owners)

117 *1.2."Particularities of the construction of the input-output table of the study sites"*

118 1.2.1. The Volta delta

119 The main information that allows doing the regionalization are the District Analytical Reports
120 (by each of the 10 districts, GSS, 2014). In particular, the "Table 4.4: Employed population 15 years
121 and older by Industry and sex" and "Table 4.3: Employed population 15 years and older by
122 occupation and sex", complemented by other information[3]. With these tables, for the Volta delta in
123 Ghana, we apportion the employment by category type (lab, mgr, tec, clk, srv, which are the unskilled
124 and skilled categories of GTAP 9[4]) and sector (each of the 57 sectors). On the one hand, we have the
125 employment by district and gender (male/female) for 21 sectors, which are split to 57 (the agricultural
126 sector is disaggregated based on the particular info of the table "Table 7.1: Households by agricultural
127 activities and locality" and the agricultural production data (MOFA, 2015); while the rest of the
128 sectors are split in the same proportion than the equivalent split of 21 to 57 at the national level of
129 Ghana, which is given in the Labour force survey that the International Labour Organization gathers
130 (ILO, 2015). At this national level, it exists the information of the employment by category type (lab,
131 mgr, tec, clk, srv) by each of the 21 sectors (ILO, 2015). But for the districts we only have the total by
132 category type (lab, mgr, tec, clk, srv), not knowing for which of the 21 districts it belongs. One could
133 split this employment by category type as for the nation (Ghana), but then the employment by each
134 of the 57 sectors already obtained would not be matched. That is why the RAS approach for this 5x57
135 employment table is needed, to match the totals by category type, and at the same time by sector
136 (already obtained as explained above for the 57 of GTAP)[5]. Other key data for the construction of the
137 IO table, in particular the agricultural sector, are the agricultural land uses, production, prices, data
138 of livestock numbers and keepers (MOFA, 2015), for fisheries, the FAO and Fisheries report 2012;
139 climatic data, etc. is obtained from the Ghana Meteorological Agency (2014).
140

141 1.2.2. The Mahanadi delta

142 The main information that allows doing the regionalization are the (PCA, 2011), (GoO, 2013),
143 (GoO, 2016). With these tables, for the Mahanadi delta in India, a RAS type approach is performed to
144 apportion the employment by category (skill) type, gender and sector (each of the 57 sectors). On the
145 one hand, we have the employment by district and gender (male/female) for the main 12
146 activities/sectors[6], which are split to 57; the agricultural sector is disaggregated based on the

---

[3] "Table 7.1: Households by agricultural activities and locality", "Table 4.6: Employed population 15 years and older by employment sector and sex", "Table 4.5: "Employed population 15 years and older by employment status and sex", "Table 2.1: Population by age, sex and type of locality" (to capture demography), "Table 4.1: Population 15 years and older by activity status and sex" (to connect the demography with employment), "Table 2.5: Birthplace by duration of residence of migrants" (to capture migration)".

[4] Lab: All other workers (previously classified as unskilled in GTAP 8), mgr: Managers and professionals, tec: Technicians and associate professionals, clk: Clerical support workers, srv: Service and sales workers.

[5] Finally, at the national level, some small corrections are applied to the employment data in order to obtain (as the ratio of the labour rows in GTAP and the employment of people) and match reasonable wages, when they do not reach a minimum of 100$ per year (e.g. as it occurs with the original data of the wage of unskilled labour in the transport sectors) or exceed the maximum of 200,000$per year (e.g. as it occurred with the wage of the Managers & professionals in the transport sector and Technicians & associate professionals in Dwellings sector).

[6] Cultivators; Agricultural labourers; Plantation, Livestock, Forestry, Fishing, Hunting & allied activities; Mining & Quarrying; Manufacturing; Electricity, Gas & Water Supply; Construction; Wholesale & Retail Trade; Hotels &

147 particular info, while the rest of the sectors are split in the same proportion than the equivalent split
148 of 12 to 57 at the national level of India, which is given in the Labour force survey that the ILO gathers,
149 (ILO 2015). At the national level, some small corrections are applied to the employment data in order
150 to obtain reasonable wages, when they do not reach a minimum of 40$ per year (e.g. as it occurs with
151 the original data of the wage of unskilled labour in the transport sectors) or exceed the maximum of
152 200,000$per year (e.g. as it occurred with the original data of the wage of the Dwellings sector). Other
153 key data for the construction of the IO table, in particular the agricultural sector, are the agricultural
154 land uses, production, prices, data of livestock, fisheries, etc. The info on geography, climate and
155 environment is obtained from several sources such as the reports on land use from the Directorate of
156 Economics and Statistics (GoO) and others: (Banerjee, R., 1986; GoO, 2015; Manmohan; PCA-Odisha,
157 (2001 & 2011); Srikanta; Vinod and Bhattacharya, 2013). Also previous background was obtained
158 from (GoO, 1986), (Ray, 1988), (Ray and Mohanti, 1989).

159 ### 1.2.3. The Indian Bengal delta

160 The key and very complete information that allows completing many vectors of the IO table and
161 doing the regionalization is (BAES, 2012). Also some information, such as the employment and
162 expenditure data is obtained by (PCA, 2011), and then the rest is complemented with other
163 information, notably on the biophysics and challenges of climate change, such as from (Ghosh and
164 Chaudhuri 2012; TEEB 2010), and (Guha and Ghosh, 2009). Key information such as that of the
165 District Statistical Handbook or the Agricultural data is also referenced from (BAES, 2012), since we
166 got a complete dataset of the North 24 Parganas and South 24 Parganas from the Government of West
167 Bengal. This included detailed information by sector on value added, production (in the case of
168 agriculture, not only production but also surface and productivity data by crop), consumption, etc.,
169 but also on intermediate goods provision, such as water and electricity.
170 With these information, a RAS type approach is performed to apportion the employment by
171 category (skill) type, gender and sector (each of the 57 sectors). On the one hand, we have the
172 employment by district and gender (male/female) for the main 12activities/sectors (see footnote 9),
173 which are split to 57 (the agricultural sector is disaggregated based on the particular info; while the
174 rest of the sectors are split in the same proportion than the equivalent split of 12 to 57 at the national
175 level of India, which is given in the Labour force survey that the ILO gathers, (ILO 2015). At the
176 national level, some small corrections are applied to the employment data in order to obtain (as the
177 ratio of the labour rows in GTAP and the employment of people) reasonable wages, when they do
178 not reach a minimum of 40$ per year (e.g. as it occurs with the original data of the wage of unskilled
179 labour in the transport sectors) or exceed the maximum of 200,000$ per year (e.g. as it occurred with
180 the original data of the wage of the Dwellings sector).
181 Other key data for the construction of the IO table, in particular the agricultural sector, are the
182 land uses, production, prices, data of livestock, fisheries, etc. The data on geography, climate and
183 environment is obtained from several sources such as (Danda et al. 2011), (SDMBRI 1996; Sarkar and
184 Bhattacharya 2003), (Hazra et al. 2002), (Hazra 2010), (Singh 2007).

185 ### 1.2.4. The Bangladeshi Bengal delta

186 The main information that allows doing the regionalization are the Bangladesh Statistical Year
187 Book (BBS, 2014), Labour Force Survey of 2010 and 2013 (BBS-LFS, 2012), Bangladesh Bureau of
188 Statistics, Alliance (2015), Household Income and Expenditure Survey (HIES, 2010), Bangladesh
189 Planning Commission, data up to 2014, and Input-Output Table of Bangladesh (data up to 2012).
190 With this information, a RAS approach is performed to apportion the employment by category
191 type (lab, mgr, tec, clk, srv) and sector (each of the 57 sectors). On the one hand, we have the
192 employment by district and gender (male/female) for the main 12 activities/sectors from ILO, which

---

Restaurants; Transport, Storage & Communications; Financial Intermediation, Real Estate, Renting & Business; Public
Administration, Other Community, Social & Personal Services, Private Households Employing Persons.

193 are split to 57 (the agricultural sector is disaggregated based on the particular info; while the rest of
194 the sectors are split in the same proportion than the equivalent split of 12 to 57 at the national level
195 of Bangladesh, which is also (apart from the BBS-LFS, 2012), given in the Labour force survey that
196 the ILO gathers, (ILO 2015). For the districts we only have the total by category type, not knowing
197 for which of the 12 districts it belongs. In the Labor Force Survey of Bangladesh for 2010, also
198 employment (by gender and skill) was available at more than 20 categories. Finally, some small
199 corrections are applied to the employment data in order to obtain (as the ratio of the labour rows in
200 GTAP and the employment of people) reasonable wages (see footnote 8). Other key data for the
201 construction of the IO table, in particular the agricultural sector, are the agricultural land uses,
202 production, prices, data of livestock, fisheries, etc. as well as geographical data as shown above.
203   For the elaboration of the delta and non-delta parts of the table of Bangladesh, it is also worth
204 pointing out the important use (apart from the Bangladesh Social Accounting Matrix 2006/07,
205 prepared by the Bangladesh Planning Commission, which is the main data feed in GTAP) of the
206 national IOT 2012, which had 86 sectors before aggregating them to the 57 GTAP sectors. We may
207 also highlight the elaboration of the private consumption vector (and actually of 5 income groups)
208 from the Household Income and Expenditure Survey for 2010 (also elaborated by the Bangladesh
209 Bureau of Statistics in 2011). From this survey, the consumption was obtained (and then transformed
210 to the corresponding price valuation and aggregated) from the original 327 items of both food and
211 non-food goods. Additional useful information was the Bangladesh Statistical Year Book of 2014,
212 prepared by Bangladesh Bureau of Statistics, the Economic Survey of Bangladesh, prepared by the
213 Ministry of Finance (2014).
214
215
216

217 **Figure S5**: Land use distribution of the Volta delta.

218
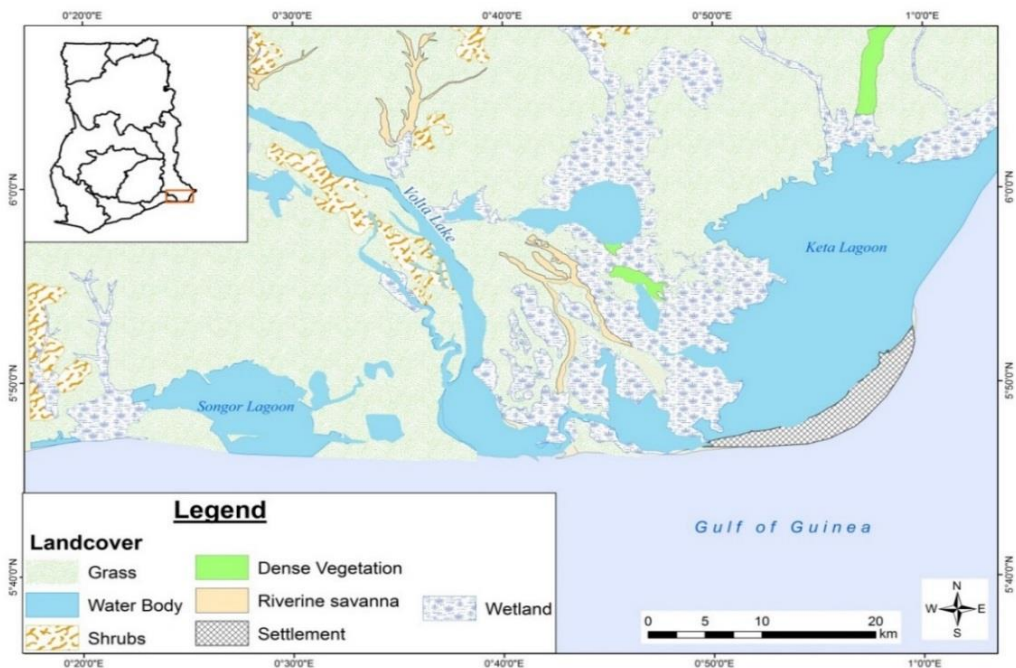
219 Source: DECCMA WP2 team at Geodata (Southampton).

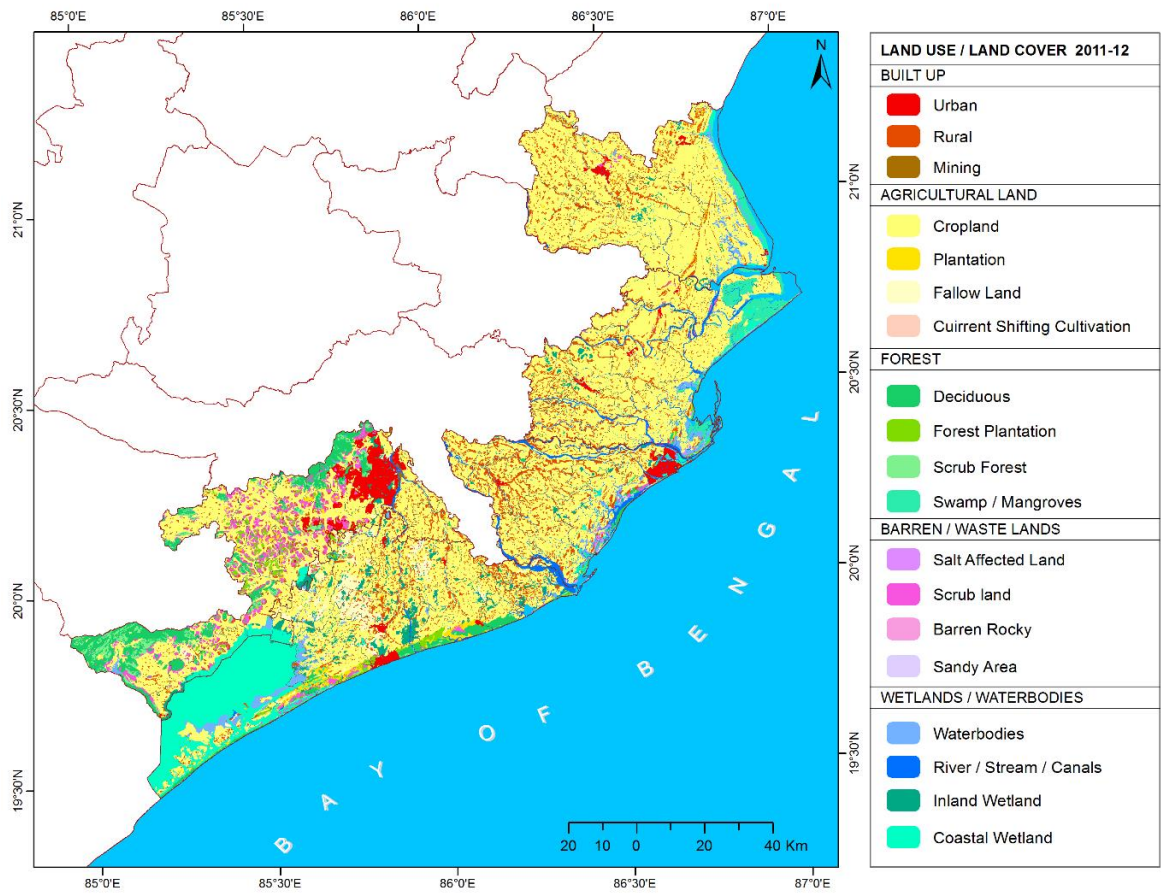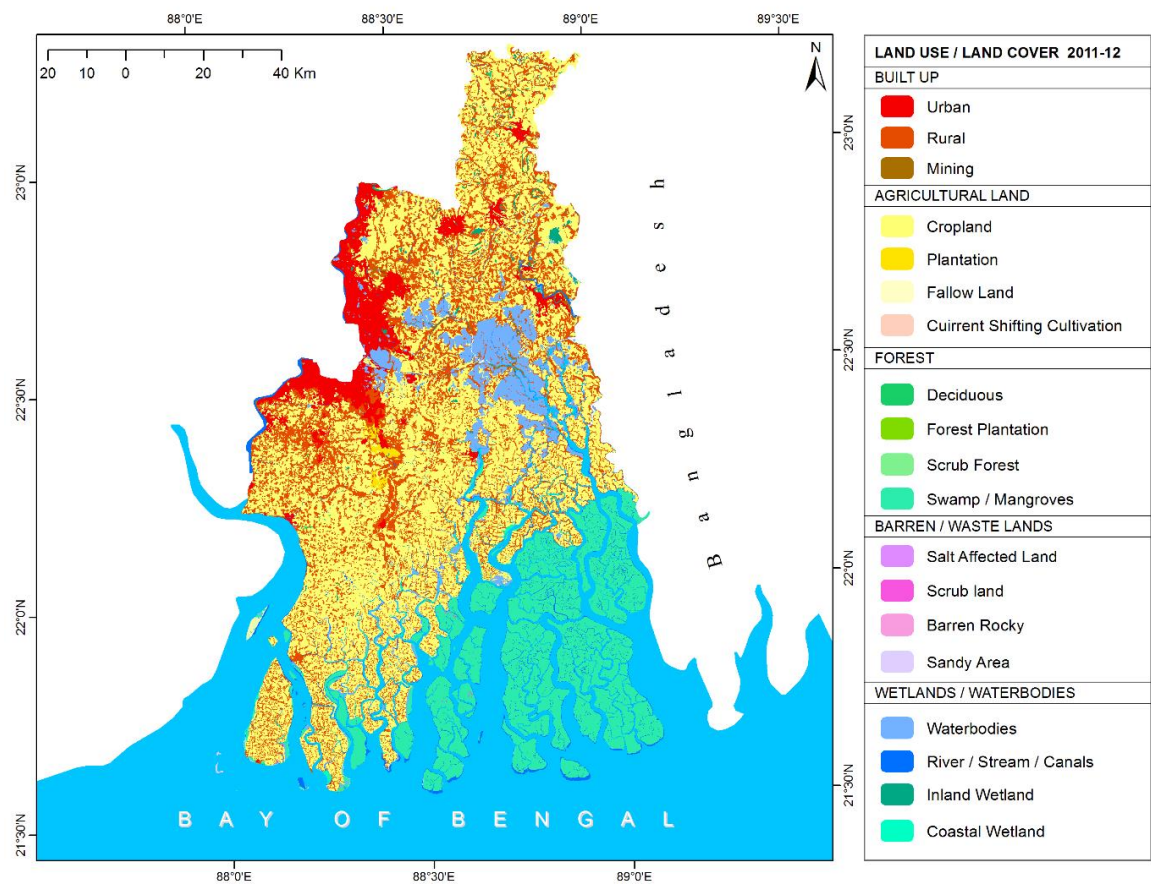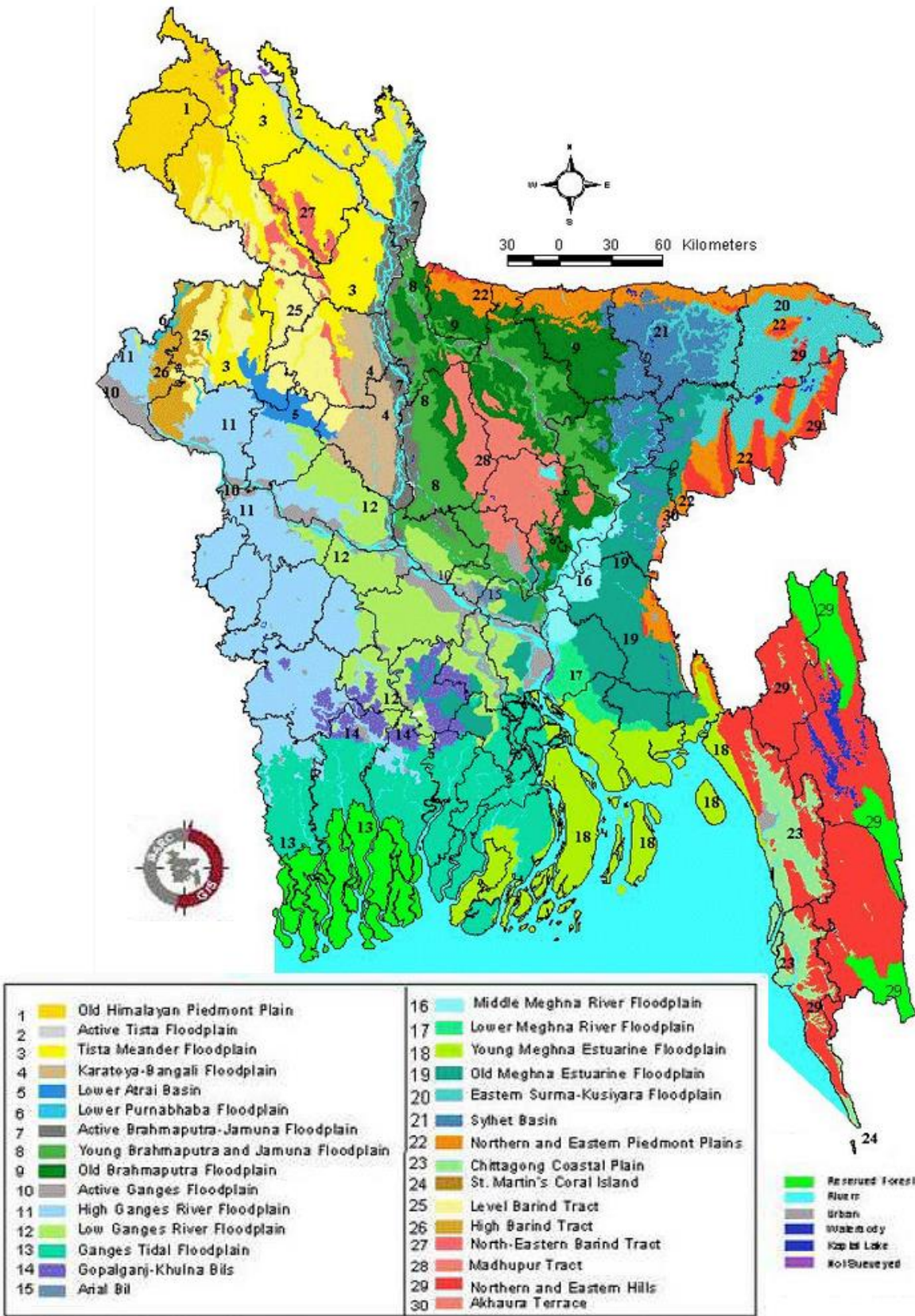220 **Figure S6**: Land use / Land Cover of Mahanadi delta.

221
222
223

224 **Figure S7**: Landuse / Land cover Map of IB delta.

225 Source: National Remote Sensing Centre (NRSC), ISRO, India.

226

227

228

229

230

231

232

233

234

235

236

237

238

239 **Figure S8**: Agro-ecological zones of Bangladesh (includes the BB delta definition).
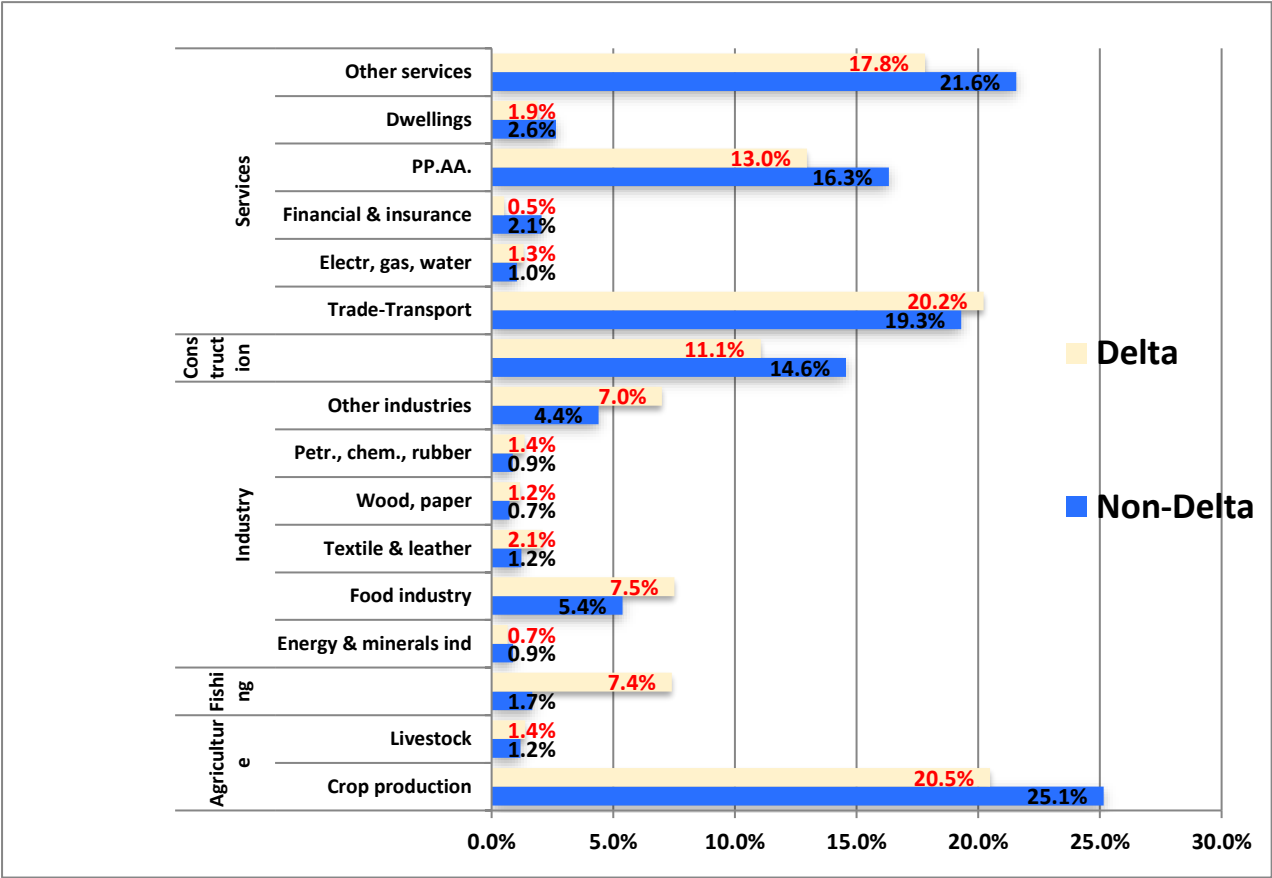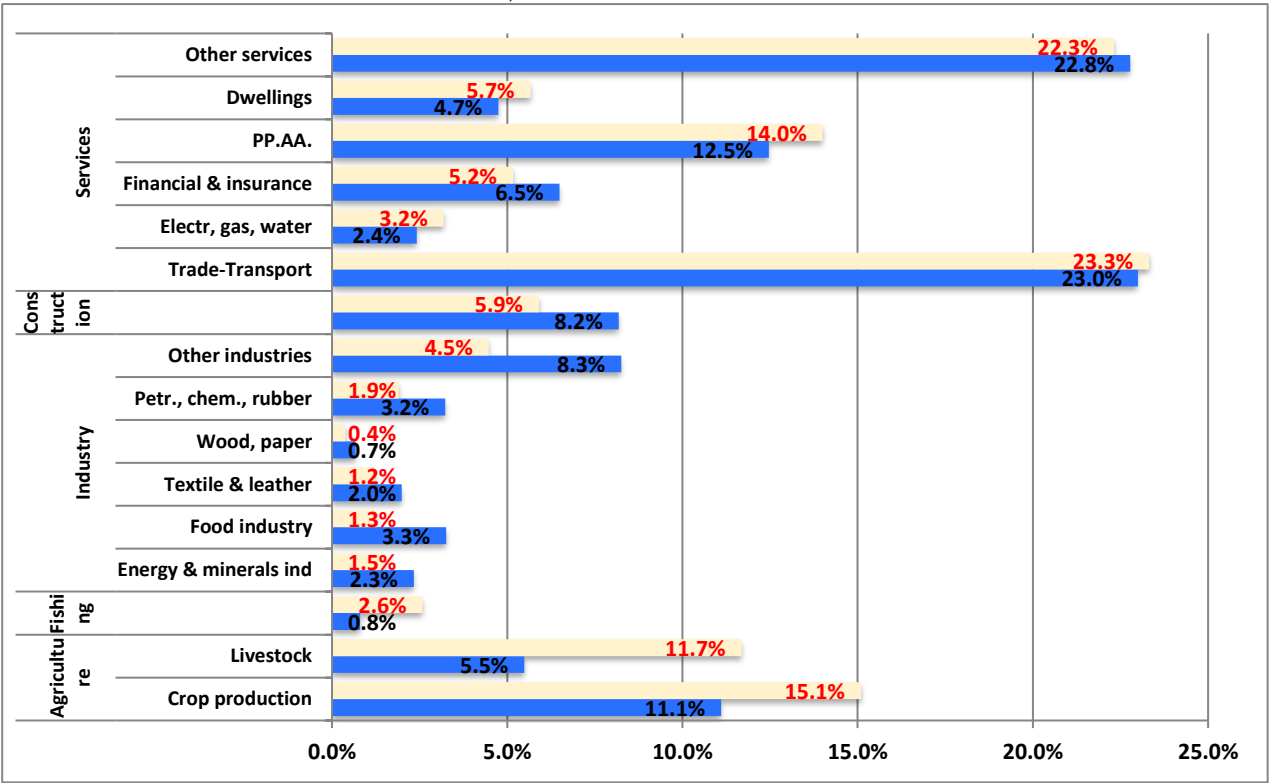

240

241 Source : BARC-GIS Project.

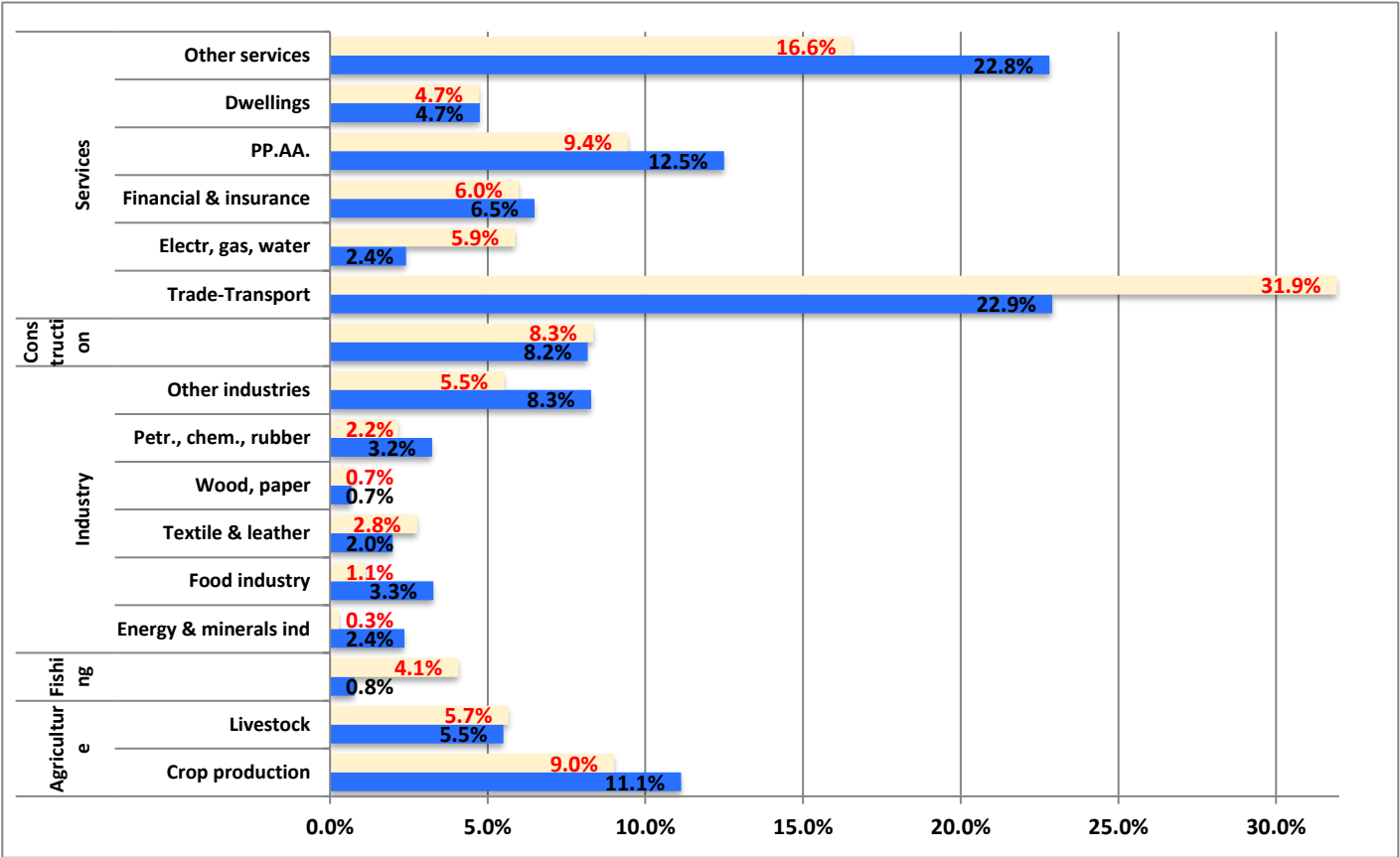**Figure S9.** Distribution of Value Added by main 16 categories for the deltas.
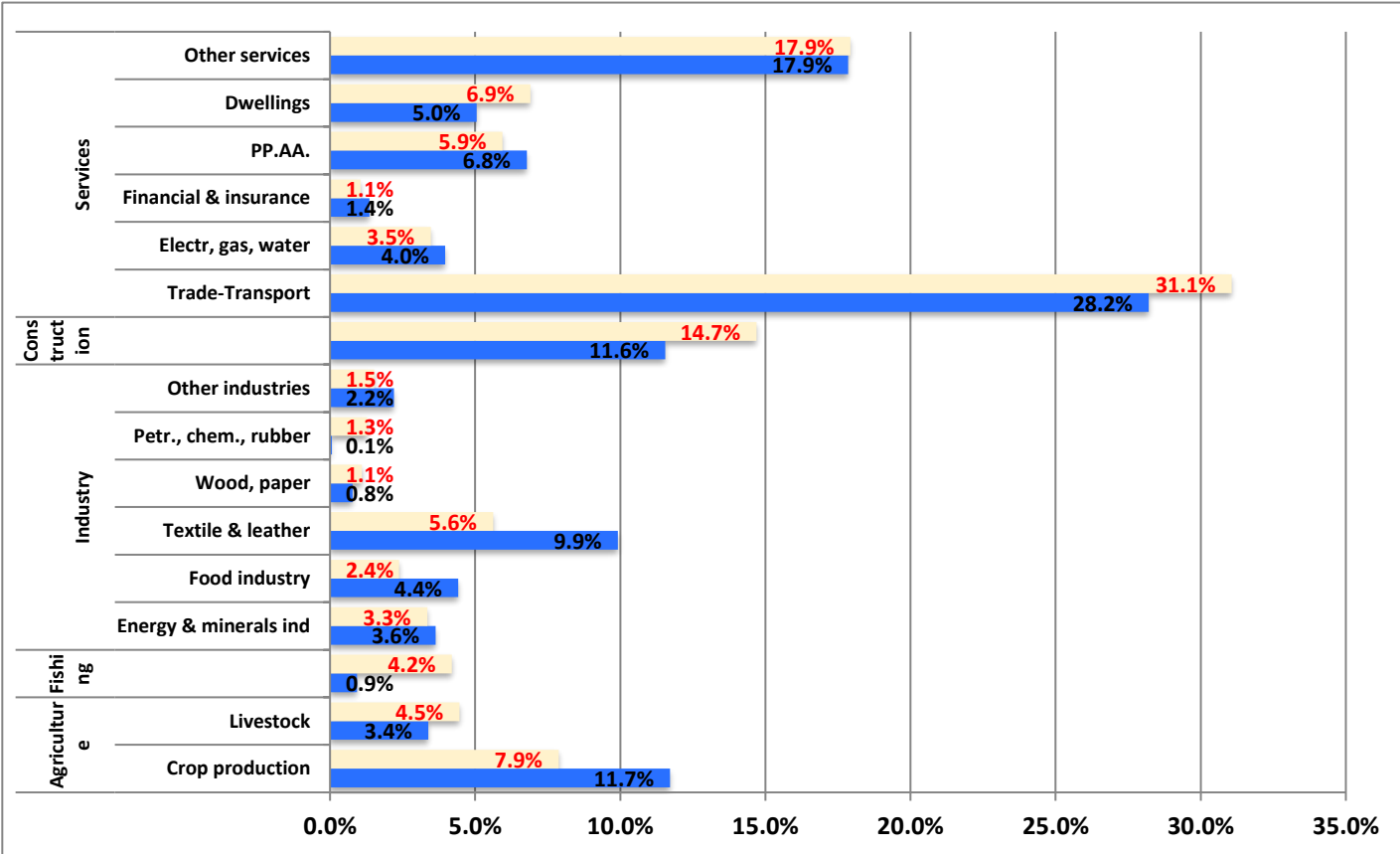
a) Volta delta

b) Mahanadi delta

c) IB delta

d) BB delta

Source: Own elaboration from the computation of VA in the input-output table of the delta and Rest of the country.

253 **Figures S10.** Employment of the delta and non-delta (x axis) by demanding region (y-axis, being
254 represented the delta in orange, non-delta in blue, and RoW in grey)

255 **a**) Volta Delta b) Mahanadi Delta

256

257 **c**) IB Delta d) BB Delta

258

259 Source: Own elaboration from the computations with the IO table and extensions of the Delta and Rest of the
260 country.

261

Figures S11. Employment (1000 people) of the delta by demanding region and sector
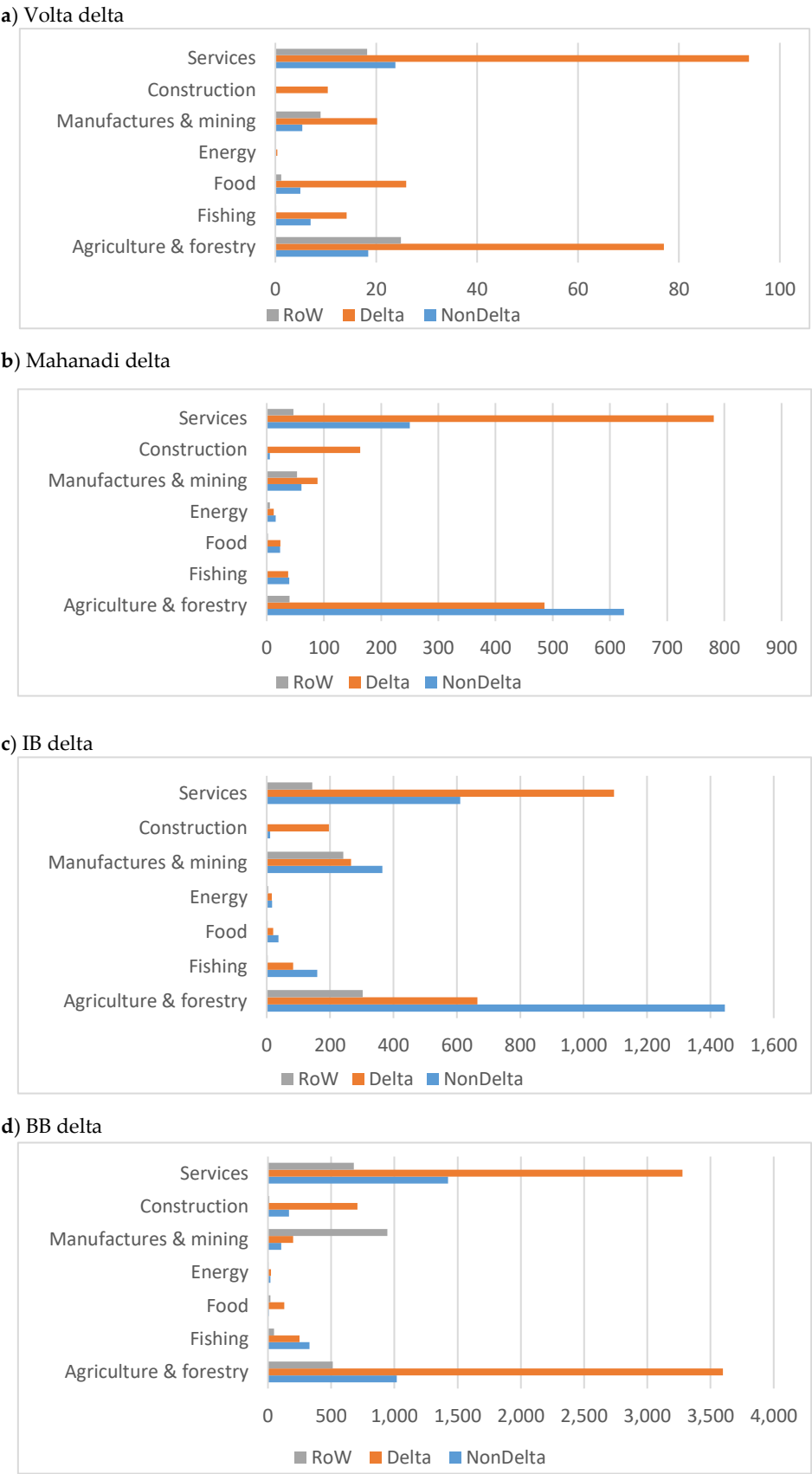
a) Volta delta

b) Mahanadi delta

c) IB delta

d) BB delta

Source: Own elaboration from the computations with the IO table and extensions of the delta and Rest of the country.

273 **Figures S12**: Employment (share per 1) by gender of the Non-Delta and Delta (x axis) by demanding
274 region (y-axis, being represented the delta in orange, non-delta in blue, and RoW in grey)

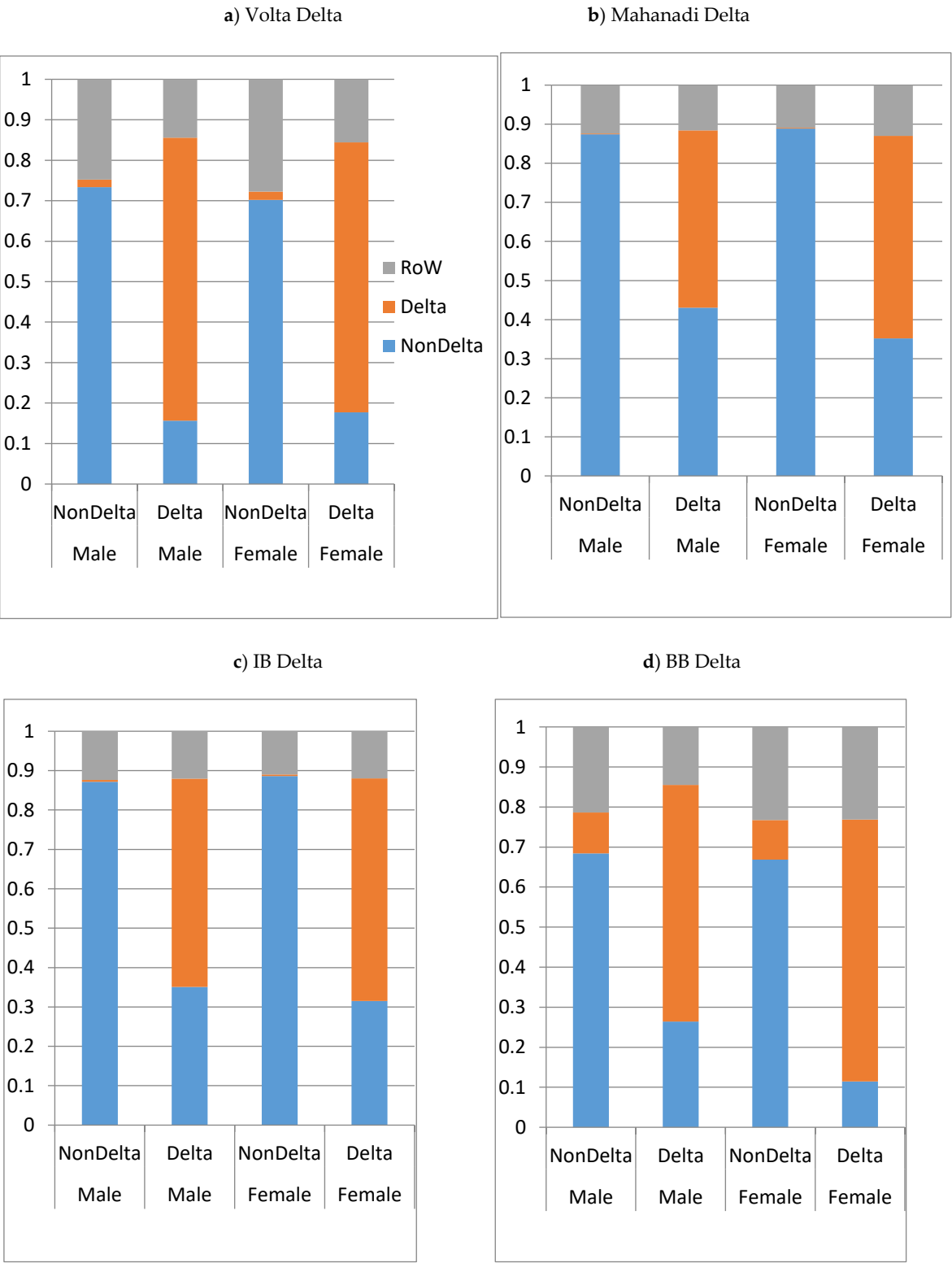275 **a**) Volta Delta **b**) Mahanadi Delta

276

277 **c**) IB Delta **d**) BB Delta

278

279 Source: Elaboration from the computations with the IO table and extensions of the Delta and Rest of the
280 country

281

282   **Figures S13**: Direct and embodied labour by sector and gender in the Non-Delta and Delta
283
284

a) Volta delta   **b**) Mahanadi delta

285

286

287   **c**) IB delta   **d**) BB delta

288

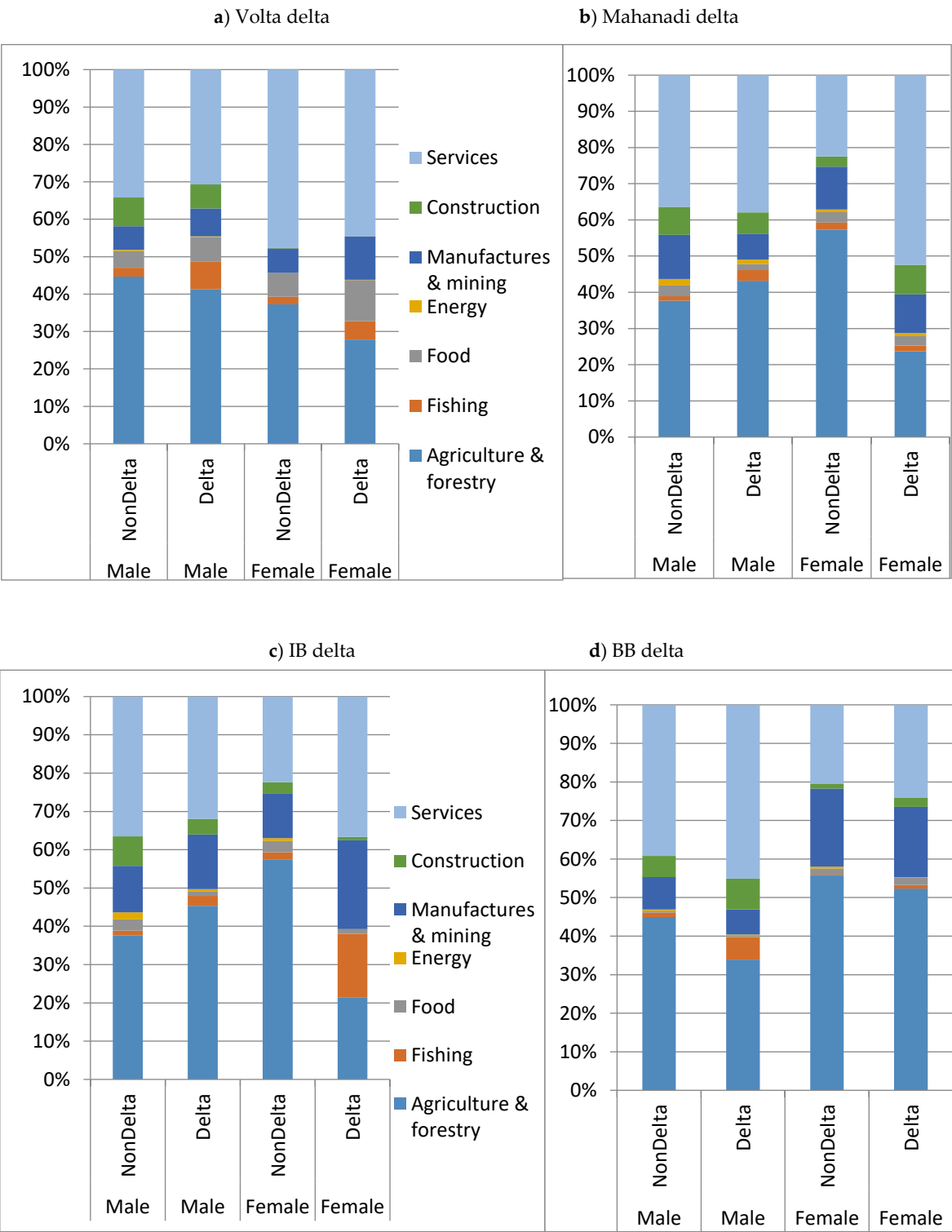289   Source: Elaboration from the computations with the IO table and extensions of the delta and Rest of the
290   country.

291

Table S2. Summary of import, export and footprints

a) Volta delta

	Direct in production	Embodied exports	Embodied imports	Net trade (E-M)	Footprint
Delta. Employment (1000 people)	355	113	318	-205	560
Delta. Land (1000 hectares)	670	222	612	-390	1060
Delta. Energy (Mtoe)	0.1	0.0	0.1	-0.1	0.2
Delta. CO2(Mt CO2)	0.1	0.0	0.1	-0.1	0.2
Non-Delta. Employment (1000 people)	9,576	2,706	2,624	83	9,493
Non-Delta. Land (1000 hectares)	17,990	4,618	4,434	184	17,806
Non-Delta. Energy (Mtoe)	2	1	1	0	2
Non-Delta. CO2 (Mt CO2)	2	1	1	0	2

Source: Own elaboration from the computations with the IO table and extensions of the delta and Rest of the country.

b) Mahanadi delta

	Direct in production	Embodied exports	Embodied imports	Net trade (E-M)	Footprint
Delta. Employment (1000 people)	2,760	1,167	1,745	-578	3,338
Delta. Land (1000 hectares)	1,518	967	627	340	1178
Delta. Energy (Mtoe)	0.4	0.2	0.3	-0.2	0.6
Delta. CO2(Mt CO2)	2.3	1.2	2.2	-1.0	3.3
Non-Delta. Employment (1000 people)	454,135	56,086	55,965	121	454,014
Non-Delta. Land (1000 hectares)	219,306	24,485	24,443	42	219,264
Non-Delta. Energy (Mtoe)	260	61	60	0	260
Non-Delta. CO2 (Mt CO2)	1,311	230	229	1	1310

Source: Own elaboration from the computations with the IO table and extensions of the delta and Rest of the country.

c) IB delta

	Direct in production	Embodied exports	Embodied imports	Net trade (E-M)	Footprint
Delta. Employment (1000 people)	5,688	3,346	2,923	423	5,265
Delta. Land (1000 hectares)	1,670	1,204	778	426	1244
Delta. Energy (Mtoe)	1.6	0.9	1.5	-0.6	2.2
Delta. CO2(Mt CO2)	10.9	5.9	9.5	-3.6	14.5
Non-Delta. Employment (1000 people)	451,111	57,560	56,986	574	450,537
Non-Delta. Land (1000 hectares)	219,385	25,507	25,169	339	219,046
Non-Delta. Energy (Mtoe)	258	62	61	1	257
Non-Delta. CO2 (Mt CO2)	1,301	236	231	5	1296

Source: Own elaboration from the computations with the IO table and extensions of the delta and Rest of the country.

d) BB delta

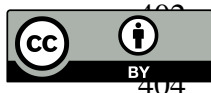|	Direct in production	Embodied exports	Embodied imports	Net trade (E-M)	Footprint
Delta. Employment (1000 people)	13,473	5,287	9,259	-3,973	17,446
Delta. Land (1000 hectares)	3,994	1,192	2,877	-1,685	5679
Delta. Energy (Mtoe)	1.2	0.6	0.8	-0.2	1.4
Delta. CO2(Mt CO2)	11.4	5.3	7.5	-2.2	13.6
Non-Delta. Employment (1000 people)	41,363	13,206	11,393	1,813	39,550
Non-Delta. Land (1000 hectares)	14,990	2,358	2,170	188	14,802
Non-Delta. Energy (Mtoe)	3	1	1	0	3
Non-Delta. CO2 (Mt CO2)	22	5	4	2	20

Source: Own elaboration from the computations with the IO table and extensions of the delta and Rest of the country.

302
303   **References of the Supplementary Material**
304

305   Afifi, T. and Warner, K. 2008. The Impact of Environmental Degradation on Migration Flows across
306   Countries. WP 5/2008. UNU-EHS Working Paper Series. Bonn: United Nations University.
307   Alauddin, M., Sarker, A. R. 2014. Climate change and farm-level adaptation decisions and strategies
308   in drought-prone and groundwater-depleted areas of Bangladesh: an empirical investigation,
309   Ecological Economics, 106, pp. 204-213.
310   Allersma, E. and W.M.K. Tilmans 1993 Coastal conditions in West Africa - a review. Ocean and
311   Coastal Management 19:199-240.
312   Appeaning Addo, K. 2015. Assessment of the Volta Delta Shoreline Change. Journal of Coastal Zone
313   Management 18(3).
314   Awadzi, T. W, Ahiabor, E, Breuning-Madsen, H (2008).The Soil-Land Use System in a Sand Spit Area
315   in the Semi-arid Coastal Savanna region of Ghana- Development, Sustainability and Threats.
316   West African Journal of Ecology. 13:132-143.
317   BAES, 2012. Bureau of Applied Economics and Statistics, Department of Statistics and Programme
318   implementation, Government of West Bengal, West Bengal India.
319   Banerjee, R. 1986. Landuse and landform studies of the Mahanadi river delta with the help of satellite
320   MSS band'. NATMO, Calcutta, India.
321   Banerjee, K. 2013. Decadal Change in the Surface Water Salinity Profile of Indian Sundarbans: A
322   Potential Indicator of Climate Change. J Marine Sci Res Development S11:002.
323   BBS-LFS. 2012. Bangladesh - Labour Force Survey 2010: Bangladesh Bureau of Statistics (BBS) -
324   Ministry of Planning.
325   BBS. 2014. Statistical Year Book, 2012. Bangladesh: Bangladesh Bureau of Statistics (BBS), Statistics &
326   Informatics Division (SID), Ministry of planning government of the People's republic of
327   Bangladesh, Dhaka, Bangladesh.
328   Black, R. Adger, N.W., Nigel, W.A., Dercon, S., Geddes, A. and Thomas, D. 2011. The effect of
329   environmental change on human migration. Global Environmental Change 21: 3-11.
330   Dasgupta, S., Huq, M., Mustafa, G., Sobhan, I., Wheeler, D. 2017. The Impact of Aquatic Salinization
331   on Fish Habitats and Poor Communities in a Changing Climate: Evidence from
332   Southwest Coastal Bangladesh, In Ecological Economics, 139, pp. 128-139.
333   Danda, A. A., G., A. Sriskanthan, J. Ghosh, Bandyopadhyay, and S. Hazra. 2011. *Indian Sundarbans*
334   *delta: A Vision*. New Delhi: World Wide Fund for Nature-India.
335   DECCMA-WP2, 2017. DECCMA study sites maps. Work of Work Package 2 (Hill et al.) in the project
336   DEltas, vulnerability and Climate Change: Migration and Adaptation.
337
338   Ghana Meteorological Agency. 2014.   Districts Weather Information.   www.meteo.gov.gh
339   Ghosh, A. and J. Chaudhuri. 2012. *Living with changing climate: Impact, vulnerability and adaptation*
340   *challenges in Indian Sundarbans*. New Delhi: Centre for Science and Environment.
341   GoO. 1986. delta Development Plan   Mahanadi delta Command Area: Geology Geomorphology and
342   Coast Building, Vol. IV.   Unpublished Report with Engineer in-chief, Irrigation Department.
343   Directorate of Agriculture & Food Production, Government of Orissa, Bhubaneswar, Orissa.
344   GoO. 2013. Odisha Agriculture Statistics 2011-12. Directorate of Agriculture & Food Production,
345   Government of Odisha, Bhubaneswar, Odisha.

346 GoO. 2015. Odisha Economic Survey 2013-2014, Planning and Coordination Department, GoO,
347   Odisha, India.

348 GoO. 2016. Odisha Economic Survey(s), 2011-12, 2013-14, 2014-15. Planning & Coordination
349   Department, Bhubaneswar, Printed at Odisha Government Press. Government of Odisha,
350   Cuttack, Odisha.

351 GSS. 2014. 2010 Population and Housing Census. (Ada East, Ada West, Akatsi South, Central Tongu,
352   Keta Municipal, Ketu North, Ketu South, Ningo Prampram, North Tongu, South Tongu).
353   District Analytical Reports. Ghana Statistical Service.

354 Guha, I., Ghosh, S. 2009. A Glimpse of the Tiger: How much are Indians Willing to pay for it? ,
355   SANDEE Working Paper No.39-09.

356 Hazra, S. 2010. Temporal change detection (2001-2008) of the Sundarban: WWF-India.

357 Hazra, S., T. Ghosh, R. D. Gupta, and G. Sen. 2002. Sea level and associated changes in the
358   Sundarbans. *Science and Culture* 68(9-12): 309-321.

359 HIES. 2015. Report of the Household Income & Expenditure Survey (HIES) 2010: Bangladesh Bureau
360   of Statistics (BBS) - Ministry of Planning.

361 ILO. 2015. Yearly indicators. Ghana, India and Bangladesh: "Population census", "Living Standards
362   Survey", "Labour force survey", "Survey of Employment and Earnings": International
363   Labour Organization.

364 IWM. 2007. Investigating the Impact of Relative Sea-Level Rise on Coastal Communities and their
365   Livelihoods in Bangladesh.

366 IWM. 2008. Impact Assessment of Climate Change and Sea Level Rise on Monsoon Flooding.

367 Manmohan, M., Mahanadi river delta, East coast of India: an overview on evolution and dynamic
368   processes'. Dept. of Geology, Utkal University, Bhubaneswar, India.

369 MOFA. 2015. Agricultural Statistics. Statistics, Research and Information Directorate, Ministry of
370   Food and Agriculture, Ghana.

371 PCA- 2011. Primary Census Abstract. Census of India, Directorate of Census Operations,
372   Government of India, New Delhi.

373 PCA-Odisha. 2001 & 2011. Primary Census Abstract (PCA)-Odisha, Census of India (2001 & 2011).
374   Government of India.

375 Ray, S.B. 1988. Sedimentological and geochemical studies on the Mahanadi River estuary, East Coast
376   of India, Unpublished Ph.D. thesis. Utkal University, Bhubaneswar, India.

377 Ray, S.B., Mohanti, M. 1989. Sedimentary processes in the Mahanadi River estuary, East Coast of
378   India, Workshop on Coastal processes and coastal Quaternaries of Eastern India. Geological
379   Survey of India, Eastern Region, Calcutta.

380 Rehdanz, K. and Maddison, D. 2005. Climate and happiness. Ecological Economics, 52(1), pp. 111-
381   125, ISSN 0921-8009.

382 Sarkar, S. K. and A. K. Bhattacharya. 2003. Conservation of biodiversity of the coastal resources of
383   Sundarbans, Northeast India: an integrated approach through environmental education.
384   *Marine Pollution Bulletin* 47: 260-264.

385 SDMBRI. 1996. *Impact of mass collection of prawn seeds in mangrove ecosystem of Sundarbans Biosphere*
386   *Reserve*. S.D. Marine Biological Research Institute.

387 Singh, O. P. 2007. "Long-term trends in the frequency of severe cyclones of Bay of Bengal:
388   Observations and simulations". *Mausam* 58 (1): 59-66.

389   Srikanta, S.V., Mahanadi delta – Geology, Resources and Biodiversity' book review. Geological
390   Society of India, P. B. No. 1922, Gavipuram P.O. Bangalore 560 019, India.
391   TEEB. 2010. *The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A*
392   *synthesis of the approach, conclusions and recommendations of TEEB.* . The Economics of
393   Ecosystems and Biodiversity (TEEB).
394   Vale, P. M. 2016. The changing climate of climate change economics, In Ecological Economics, 121,
395   pp. 12-19.
396   Vinod, K., Bhattacharya, A. 2003. Geological evolution of Mahanadi delta, Orissa using high
397   resolution satellite data. National Remote Sensing Agency, Balangar, Hydrabad, India.

398
399
400
401