

An Analysis of Growth and Competitiveness of India's Climate Smart Goods Exports

Ms Divya Vaid^{1*} | Dr. Meenu²

¹Research Scholar, Department of Economics, Panjab University, Chandigarh, India.

²Assistant Professor, Department of Economics, Panjab University, Chandigarh, India.

*Corresponding Author: sipecono@gmail.com

Citation: Vaid, D., & Meenu, M. (2025). *An Analysis of Growth and Competitiveness of India's Climate Smart Goods Exports*. *International Journal of Advanced Research in Commerce, Management & Social Science*, 08(03(I)), 191–200. [https://doi.org/10.62823/ijarcms/8.3\(i\).8026](https://doi.org/10.62823/ijarcms/8.3(i).8026)

ABSTRACT

Climate Smart Goods have become a vital part of foreign trade for the sustainable development of any economy, with an increasing emphasis on mitigating climate issues. Climate Smart goods contribute not only towards inclusive development, but they also facilitate the environment-conscious markets in the world due to alarming climate issues such as greenhouse gas emissions. The study attempts to find climate-friendly or environmentally aware commodities to contribute towards the environmentally sound trade, especially in the context of India. The study used the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) list of 64 climate smart goods for the analysis purpose. Secondary data from the UN Comtrade is collected for the years 1988 to 2019. The study measured the compound annual growth rate and a revealed comparative advantage (RCA) for the exports of climate smart goods of India for the considered study period. The study observed that India's total CSGs exports grew at a higher rate compared to India's total exports for the whole study period (i.e., 1988 to 2019), and for the sub-periods, i.e., 1991 to 2000, 2001 to 2010, and 2011 to 2019. The study found that sixteen climate smart goods (belonging to the chapters 56, 70, 73, 84, 85, and 90) recorded a growth rate of more than 50 percent for the whole study period, i.e., 1988 to 2019. During 2011 to 2019, the HS code 841181 (gas turbines of a power not exceeding 5,000 kW) recorded a growth rate of more than 50 percent (i.e., 65.3 percent). Among 64 CSGs, the maximum number of sub-categories of CSGs observed positive but less than 50 percent export growth for the recent sub-period, i.e., 2011 to 2019. As per the average values, India confirmed export competitiveness for the considered study periods, except for the year 1995. For the initial year, i.e., 1988, India registered a revealed comparative advantage (RCA) of more than unity for twenty-two CSGs, but it revealed a comparative advantage of more than unity for thirty-one CSGs in the last year of the study period, i.e., 2019. It is evident from the results that the maximum sub-categories of India's CSGs with export competitiveness belong to the Chapters 84 and 85 of the Harmonized System (HS) of classification.

Keywords: Climate Smart Goods, Exports, Growth, Competitiveness, India.

Introduction

Countries trade because of their differences in terms of Comparative advantage and to achieve economies of scale in Production (Krugman, Obstfeld & Melitz, 2014). The trade performance of a country is so closely and inextricably linked with its overall economic performance that it aims at promoting exports, along with making imports more focused and rational. (Foreign Trade Policy, 2015-2020)

The Trade and Environment issue has been addressed in the Doha ministerial conference under the World Trade Organisation (WTO) in 2001. This negotiation was led forward by the Committee on Trade and Environment Special Session (CTESS). The WTO recommended the Asia-Pacific Economic Cooperation (APEC) List (54 goods), which worked as a starting point for the Environment Goods Agreement in 2014. Out of these 54 environmental goods, 48 are part of 153 goods mentioned under the Friends list (i.e. 9 member countries of the WTO) (Export-Import Bank of India, 2017). Nowadays, the focus of countries has turned towards climate issues arising from trade. Various conventions on climate change have been organised in the past and also in the present to raise awareness among environmentally aware countries. Countries are giving more attention to trade in Climate Smart Goods (CSGs) because their production process has minimal or no greenhouse gas emissions and a negative impact on the environment (Mathur, 2014).

The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) have identified 64 CSGs as part of environmental goods and services, considering the different lists of APEC, OECD, World Bank, and WTO. The given paper considered 64 climate smart goods at the six-digit level. Climate Smart Goods (CSGs) are defined as components, products, and technologies that tend to have a relatively less adverse impact on the environment. CSGs consist of low-carbon technologies under five groups, such as clean coal technologies, comprised of HS codes 840510, 841181, and 841182, wind power generation technologies contained in HS codes 848340 and 848360, the solar photovoltaic system includes HS codes, i.e. 850720, 853710, 854140, the fourth group, i.e. energy-efficient lighting, has only one HS code, i.e., 853931, whereas the rest of the goods are included under the fifth group, i.e. other codes (United Nations Economic and Social Commission for Asia and the Pacific, 2011).

India's climate smart goods (UNESCAP List) exports share in India's total exports was 0.43% in the year 1988, which has increased to 2.17% in the year. Few studies explored the climate smart goods exports, while most of the studies analysed the trade of environment goods. With this background, the objective of the study is to examine the growth and competitiveness of India's CSGs exports for the study period, i.e., 1988 to 2019.

Review of Literature

Alavi (2007) studied the trend of Environment Goods (EGs) for Asian countries and the trade barriers faced by considering four sectors, such as pollution abatement/treatment industry, the wind turbine industry, biofuels, and wood and wood-based products, for evaluation through a case study approach. China, Korea, Southeast Asia, and India emerged as the major exporters of the four considered sectors. Developed countries faced SPS, TBT, Subsidies, and quantitative restrictions in the considered sectors, while developing countries faced hurdles to exports, such as subsidies tied to aid commitments, bureaucratic and quantitative restrictions. **Mathur (2014)** examined the trade of 64 Climate Smart Goods (CSGs) of Ecuador with its 62 trading partners, for the year 2010. The paper used different trade indices (Revealed Comparative Advantage, Export Specialisation Index, and Competitiveness Index), and SMART Analysis to estimate trade creation and trade diversion, and gravity analysis to measure the impact of determinants on Ecuador's trade in 2010. The paper showed that most of the economic groupings had improved competitiveness in 2008, and Ecuador registered a comparative advantage in HS Code 732111(solar-driven stoves) and HS Code 732190 (stoves, ranges, gas rings) in 2010. The export specialisation index depicted that Chile, Colombia, and Peru have an advantage over Ecuador. As per SMART analysis, Ecuador experienced an advantage in terms of trade, welfare, and consumer surplus effect with China, the US, and Japan through the liberalisation of imports of CSG of Ecuador. It is observed that the size (GDP) of the economy had a positive impact on Ecuador's trade with its trading partners, whereas distance, exporter countries' price, and tariffs harmed the trade of Ecuador with its trading partners. **EXIM Bank (2017)** studied the trade performance of India concerning Environmental Goods (EGs), considering the Friends' List of 153 EGs and the Asia-Pacific Economic Cooperation (APEC) List of 54 EGs for the years 2011 to 2015. India's exports of EGs recorded a positive growth rate, while Imports recorded a negative growth rate during 2011-2015 under the Friends' list and the APEC list. The paper revealed that 7 goods emerged as product champions, 29 products as underachievers, 12 products as losers in the market, and 5 products as growing based on the comparative advantage under the APEC list of environmental goods only. **Dinda (2018)** estimated Asia's Climate-friendly goods and technologies (CFGT) import for the year 2006, its export for the year 2005, and both export and import for the year 2008 by using the gravity model for Asian countries within the

region and inter-region, such as North America and the European Union. The determinants, such as income, policy reforms, infrastructure, and development position of the reporter and partner country, appeared as the major determinants of CFGT trade and its sub-categories. **Chowdhury and Islam (2018)** examined the trade trends and trading patterns of China's Climate Smart Goods (CSG) trade with the rest of the world for the study period of 1992-2016. It revealed that the CSGs trade of China has increased, but its share in total trade was low during the given study period. The CSG products, such as Photosensitive semiconductor devices (854140), machine and mechanical appliances (847989), a discharge lamp, fluorescents (853931), and cooking appliances and plate warmers (732111), emerged as the major export and import of China's CSG trade. The major trading partners of China in the case of Climate Smart goods are Japan, India, Malaysia, the USA, the Netherlands, Thailand, etc., including both developed and developing countries for the considered time period. **Ahmad et.al (2018)** studied the trade patterns of India and China using revealed comparative advantage (RCA) and bilateral revealed comparative advantage (BRCA) at an aggregate level from 1985-86 to 2012-13. The study found competitiveness for both economies at the global level, and as per the estimates of BRCA, China was found to be more successful in capturing the Indian market than India in high-value products. At the four-digit level of SITC, both nations emerged as competitive in the global market. The paper showed that India and China observed $RCA > 1$ for 135 products, while there were 440 products with the value of RCA less than one. China recorded a comparative advantage, but India had a comparative disadvantage in products such as the food industry, home and office appliances, transportation, chemicals, the manufacturing industry, and electrical and mechanical devices. **Maryam and Mittal (2019)** explored the trade flow between India and BRICS with the help of the bilateral revealed comparative advantage index (BRCA) and trade complementarity index (TCI) for the period 2001 to 2015. India enjoyed a comparative advantage in agriculture and allied products, manufacturing, and man-made products. Also, the paper witnessed improvement in the degree of complementarity between India and BRICS nations over the period 2001-2015. India confirmed high complementarity with Brazil, followed by South Africa, while the complementarity with China improved over time. The result of the gravity model revealed that distance was the major constraint, with a negative sign for the trade flow among the nations, while growth in economic size had a positive impact on the bilateral trade flows between India and its partners.

Data Source and Research Methodology

Secondary data was collected from the UN Comtrade for 32 years, i.e., 1988 to 2019, to examine the growth and competitiveness of India's Climate Smart Goods (CSGs). The paper considered the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) list of 64 CSGs at the Harmonized System (HS) 6-digit level to analyse the performance of these goods in the context of India. The study showed the sub-categories of CSGs under the five groups, i.e., clean coal technologies, comprised of HS codes 840510, 841181, and 841182, wind power generation technologies contained in HS codes 848340 and 848360, the solar photovoltaic system includes HS codes, i.e. 850720, 853710, 854140, and the energy-efficient lighting presented by the HS codes 853931, the remaining 55 sub-categories of CSGs included under the group 'other codes'. These 64 CSGs at the 6-digit level are part of broader chapters, i.e., 38, 39, 56, 70, 73, 76, 84, 85, 89 and 90 of HS classification. The study analysed the growth and competitiveness (using the revealed comparative advantage method) of exports of each sub-category of climate smart goods.

Growth Rates of India's Climate Smart Goods Exports

To find out the growth of exports of India's Climate Smart Goods, the annual average growth rates are computed. The growth rates are calculated by fitting the exponential function of the type:

$$Y_t = ab^t e^u$$

Transforming the above equation into linear form:

$$\log y_t = \log a + t \log b + u \log e$$

Where

Y_t = value of the dependent variable in the year t

T = trend variable

u = disturbance term

a & b = constants

For the estimated value of the regression coefficient 'b', the compound growth rate 'r' was calculated as follows:

$$r (\%) = (b^t - 1) \times 100$$

Where, b^t = estimated value of b

The growth rates are calculated for the whole of the study period, i.e., 1988 to 2019, and also for the following sub-periods.

- 1991 to 2000 (b) 2001 to 2010 (c) 2011 to 2019

Revealed Comparative Advantage (RCA)

Revealed Comparative Advantage measures the ratio of the share of a particular product in a country's total exports to the share of that product in world exports. The RCA is defined as:

$$RCA_{ij} = (X_{ij}/X_{it}) / (X_{wj}/X_{wt})$$

Where,

RCA_{ij} = Revealed Comparative Advantage for country i in product j

X_{ij} = country i's exports of product j

X_{it} = country i's total exports

X_{wj} = world's exports of product j

X_{wt} = world's total exports

Revealed Comparative Advantage is used to identify the products with a comparative advantage.

- $RCA > 1$ implies that the product is highly competitive and the country has a comparative advantage in that particular product compared with the world as a whole.
- $RCA < 1$ implies that the country has a revealed comparative disadvantage in exporting the product compared with the world as a whole.

The paper examined the revealed comparative advantage of India's climate smart goods exports for the selected points of the study period, i.e., 1988, 1991, 1995, 2000, 2005, 2010, and 2015 to 2019.

Results and Discussion

Under this section, the growth of India's Climate Smart Goods (CSGs) is analysed, and later, the Revealed Comparative Advantage (RCA) is presented. **Table 1** presents the growth of exports of India's climate smart goods (CSGs) for the whole study period, i.e., 1988 to 2019, and for the sub-periods, i.e., 1991 to 2000, 2001 to 2010, and 2011 to 2019. It is observed that India's total CSGs exports grew at a higher rate (i.e., 17.9 percent) than India's total exports (i.e., 12.3 percent). Also, India's total CSGs exports recorded higher growth as compared to India's total exports for the considered sub-periods (i.e., 1991 to 2000, 2001 to 2010, and 2011 to 2019). Among 64 CSGs, India witnessed a growth of more than 50 percent for eleven CSGs, while the rest of the CSGs registered less than 50 percent growth during 1988 to 2019. Contrary to this, India recorded growth of more than 50 percent for ten CSGs in the first decade (i.e., 1991 to 2000, while the number of CSGs with more than 50 percent growth increased to fifteen in the second decade i.e., 2001 to 2010. During 2011 to 2019, a single sub-category, i.e., HS code 841181, recorded a growth of more than 50 percent (i.e., 65.3 percent). Seventeen CSGs registered negative growth rates, while forty-six sub-categories of CSGs recorded positive but less than 50 percent growth in India's CSGs exports.

Table 1: Growth Rates of Sub-Categories of India's Climate Smart Goods Exports (in %)

Groups	HS Codes	1988 to 2019	1991 to 2000	2001 to 2010	2011 to 2019
Wind Power Generation	848340	22.7	1.3	44.8	26.3
	848360	21.1	7.8	53.3	-3.2
Clean Coal Technologies	840510	20.6	53.9	37.6	-4.6
	841181	69.1	-86.3	45.5	65.3
	841182	63.3	171	38.1	2.6

Energy Efficient Lighting	853931	17.1	15.7	34.1	-7.8
Solar Photovoltaic System	850720	11.6	-8.3	34.6	13.1
	854140	35.3	73.2	38.1	-2.7
	853710	30.5	13.6	70.8	14
Other Codes	380210	36.9	30	35.7	9.3
	392010	11.9	7	18.1	14.2
	392690	15.2	8.6	21.1	4.9
	560314	168.9	NA	5	23.6
	700800	76.5	153.7	81.9	25.5
	701931	16.6	-8.8	25.9	-1.6
	730820	18.7	31.4	27.4	2.8
	730900	14.2	-12.9	53.8	5.9
	730431	62.4	21.7	38.1	1.5
	730441	82.5	242.3	33	27.5
	730451	38.8	5.4	91	-8.3
	732111	13.7	8	24.2	10.5
	732190	12.9	8.6	11	-0.5
	732490	14.1	2.7	24.1	-5.7
	761100	-0.4	1.6	-8.8	1.6
	761290	15.4	7.8	15	2
	840219	11.1	13.9	19.3	-1.7
	840290	17.7	-9.4	34	7.4
	840410	25.7	64.3	20.7	21.5
	840490	25.1	23.5	38.2	-2.6
	840681	175.1	NA	32.3	24.3
	840682	187	NA	6.4	21.4
	841011	90.1	729.9	5	36.8
	841012	121.7	-36.8	8.3	11.2
	841013	169.7	188.5	228.1	23.9
	841090	29.4	25.3	44.7	4.1
	841581	7.5	33.7	3.9	1
	841861	32.6	25.1	15.1	-0.3
	841869	15.7	14.5	16.9	5.6
	841919	23.3	20.8	55.4	-12.1
	841940	28.8	36.1	43.7	4.8
	841950	27.2	24.1	53	11.3
	841989	18.8	9.2	52.2	-0.5
	841990	18.2	6.6	31.9	1.1
	842129	24.6	12.2	33.1	25.6
	842139	32.4	32.3	52.5	12.4
	850161	19	8.2	53.4	6.1
	850162	19.9	23.6	18.1	35.9
	850163	65.8	39	23.7	15.5
	850164	31.9	54.5	38.3	10.1
	850231	199.1	NA	148.1	-9.5
	850239	170.6	NA	9.7	6.1
	850680	156.3	NA	-0.1	-8.7
	850300	23	26.4	33.8	6.8
	850440	36.3	33	65.5	12.5
	847989	14.9	15.9	19	9.6
	890790	37.6	-10.3	62.3	-1.7
	900190	9.9	21.8	-1.1	-0.4
	900290	21.3	22.4	23.4	2.3
	903210	32.4	23.6	35.6	8.5

	903220	190.7	NA	326.1	39.9
	902830	39.1	142.9	25.9	3.9
	903020	13.9	-11.3	38.1	14.6
	903031	21.1	16.6	1.9	31.4
	903039	8.2	20.6	-4.8	10.7
Total CSGs Exports		17.9	13.3	35	8.2
India's Total Exports		12.3	9.3	20.7	0.2

Source: Author's Calculations

It is observed from **Table 2** that India registered a revealed comparative advantage (RCA) for twenty-two CSGs in the initial year of the study period, i.e., 1988, while it witnessed competitiveness (i.e., $RCA > 1$) for thirty-one CSGs in the last year of the study period, i.e., 2019. As per the average values of RCA, India confirmed export competitiveness in 64 CSGs globally, for all the considered years of the study period, except for the year 1995. India confirmed competitiveness in exports of more than 30 CSGs during the recent years of the study period, i.e., 2015 to 2019.

Table 2: Revealed Comparative Advantage (RCA) of India's Climate Smart Goods

HS Codes	1988	1991	1995	2000	2005	2010	2015	2016	2017	2018	2019
380210	0.28	0.34	0.31	1.25	5.80	4.35	7.42	7.81	8.27	9.07	6.95
392010	1.95	1.42	1.30	0.83	0.94	0.22	0.29	0.34	0.33	0.38	0.38
392690	1.02	1.20	4.41	1.34	0.87	0.84	1.15	1.19	0.97	0.76	0.69
560314	NA	NA	NA	0.02	0.00	0.08	1.20	1.20	0.85	0.50	0.43
700800	NA	NA	0.07	0.02	0.04	0.15	0.24	0.40	0.28	0.41	0.32
701931	3.84	0.84	0.15	0.08	0.61	0.92	1.41	0.99	0.90	0.55	0.60
730431	NA	0.03	0.20	1.45	0.73	0.58	2.50	0.67	0.81	1.18	0.79
730441	NA	NA	1.86	0.35	1.01	0.24	2.43	3.98	4.23	4.02	3.65
730451	0.54	0.11	0.64	0.16	0.28	2.26	1.12	1.24	1.20	0.94	1.13
730820	1.55	12.54	9.11	54.77	14.12	4.88	11.54	7.76	11.34	6.80	7.69
730900	4.14	8.32	0.40	0.87	0.39	2.88	0.69	0.93	0.85	0.79	0.59
732111	1.04	0.38	0.13	0.32	0.22	0.12	0.12	0.17	0.12	0.14	0.15
732190	0.95	0.49	0.08	0.22	1.68	0.11	0.12	0.11	0.16	0.18	0.12
732490	0.81	1.17	0.42	1.54	1.01	0.63	0.36	0.39	0.29	0.17	0.15
761100	0.94	1.43	0.47	0.20	0.76	0.14	0.07	0.07	0.02	0.02	0.08
761290	1.40	0.61	0.34	0.37	0.37	0.35	0.92	0.58	0.55	0.64	0.50
840219	2.38	5.23	2.68	8.23	7.45	4.93	4.36	3.18	2.08	3.48	2.18
840290	8.17	7.18	1.12	1.18	1.68	0.99	4.34	4.99	3.90	6.17	4.55
840410	2.13	0.02	0.00	1.02	5.71	0.83	1.06	1.41	0.96	2.45	6.23
840490	0.94	0.58	0.12	0.71	2.52	1.98	3.37	6.15	4.08	3.35	3.52
840510	1.92	0.63	1.72	9.13	2.79	3.06	3.14	3.93	4.90	4.40	2.40
840681	NA	NA	NA	1.54	0.74	0.18	5.16	2.23	1.32	6.34	6.94
840682	NA	NA	NA	1.23	0.87	0.65	4.55	3.51	10.99	11.85	10.63
841011	40.06	0.77	1.18	6.10	3.06	0.91	3.53	2.51	13.85	10.68	5.62
841012	NA	NA	NA	0.05	2.23	4.22	6.89	12.14	6.17	5.50	5.57
841013	NA	NA	0.07	3.58	0.60	0.03	1.88	3.85	16.27	7.12	8.31
841090	2.87	0.09	0.09	0.97	1.37	2.51	4.97	4.22	4.12	4.29	3.92
841181	0.00	2.65	0.47	NA	0.60	0.51	0.17	1.12	0.68	1.71	3.23
841182	NA	NA	0.32	0.00	2.85	1.59	0.41	0.17	0.63	0.68	0.63
841581	0.07	0.01	0.60	0.20	0.38	0.09	0.02	0.03	0.06	0.04	0.03
841861	0.00	0.10	0.00	0.18	0.22	0.06	0.18	0.24	0.05	0.08	0.07
841869	2.02	1.07	0.54	1.69	1.23	0.34	0.45	0.48	0.55	0.40	0.36
841919	0.48	1.15	0.07	0.95	0.40	0.45	1.80	1.32	0.27	0.11	0.46
841940	0.77	0.04	0.86	1.04	2.60	3.60	5.90	6.77	6.35	6.49	2.09
841950	0.37	0.08	0.34	0.82	0.96	1.52	1.47	2.01	1.87	1.40	1.31
841989	2.00	1.07	0.74	1.05	2.16	7.72	1.63	1.60	2.07	1.88	1.62
841990	0.62	2.06	0.56	0.99	2.21	2.21	1.96	1.66	1.39	1.35	1.10
842129	0.12	0.13	0.20	0.16	0.27	0.25	0.67	0.62	0.59	0.88	0.78

842139	0.23	0.02	0.08	0.10	0.15	0.25	0.65	0.52	0.49	0.53	0.39
847989	0.79	0.44	0.46	0.55	0.51	0.47	0.96	0.89	0.93	0.73	0.70
848340	0.59	0.43	0.26	0.32	0.52	0.51	0.97	1.11	1.43	1.80	1.94
848360	0.37	0.74	0.66	0.55	0.90	2.00	1.54	1.43	1.13	1.14	1.06
850161	0.97	1.63	0.16	0.89	2.74	2.23	1.78	1.61	1.74	1.64	2.66
850162	3.47	1.04	0.04	1.38	1.44	0.30	1.32	1.06	0.99	1.19	1.17
850163	0.23	0.59	NA	0.61	2.50	0.42	1.17	0.91	1.26	1.63	2.01
850164	0.01	0.03	0.22	1.90	1.20	1.06	2.01	1.97	2.16	1.83	1.68
850231	NA	NA	NA	1.74	2.91	2.49	0.06	0.10	0.32	0.48	0.40
850239	NA	NA	NA	3.01	0.79	0.23	0.64	0.59	0.79	0.75	0.81
850300	1.18	0.99	0.33	2.30	0.85	1.87	1.65	1.38	1.44	2.22	2.66
850440	0.02	0.17	0.11	0.12	1.70	0.90	1.00	1.08	1.02	1.12	1.48
850680	NA	NA	NA	4.70	0.88	4.15	0.39	0.29	0.28	0.25	0.50
850720	24.90	18.23	0.92	1.08	0.45	0.71	1.28	1.45	1.54	1.82	1.75
853710	0.15	0.12	0.14	0.19	0.15	0.38	0.69	0.71	0.58	0.53	0.52
853931	2.58	0.23	0.72	0.62	0.78	0.31	0.38	0.69	1.02	0.85	0.45
854140	0.01	0.06	0.30	1.86	1.39	0.90	0.26	0.24	0.26	0.20	0.37
890790	0.04	4.14	0.10	0.10	0.05	0.31	0.32	0.02	0.07	1.40	0.19
900190	2.41	0.16	0.40	0.63	0.17	0.04	0.05	0.05	0.04	0.05	0.04
900290	0.03	0.24	0.01	0.16	0.20	0.15	0.15	0.11	0.26	0.15	0.19
902830	0.17	0.00	0.98	7.45	3.07	2.80	2.50	3.41	4.23	2.55	1.12
903020	1.21	0.43	0.07	0.28	0.60	0.27	0.27	0.40	0.78	0.54	0.38
903031	0.02	0.04	0.00	0.03	0.10	0.11	0.16	0.32	0.40	0.33	0.24
903039	1.10	0.98	1.57	4.40	2.12	0.87	1.52	1.25	1.28	1.58	1.30
903210	0.02	0.02	0.01	0.05	0.15	0.21	0.24	0.26	0.31	0.27	0.21
903220	NA	NA	NA	0.00	0.36	0.24	0.07	0.06	0.34	0.77	0.97
Average	2.43	1.59	0.71	2.22	1.54	1.27	1.74	1.78	2.18	2.09	1.89

Source: Author's Calculations

Conclusion and Suggestions

The study found that the exports of sub-categories of climate smart goods (CSGs) belong to the chapters 56 (wadding, felt and non-wovens; special yarns; twine, cordage, ropes and cables and articles thereof), 70 (glass and glassware), 73 (articles of iron or steel), 84 (nuclear reactors, boilers, machinery and mechanical appliances; parts thereof), 85 (electrical machinery and equipment and parts thereof), and 90 (optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof) grew at more than 50 for whole of the study period. Also, India observed export competitiveness in the sub-categories of CSGs, which mainly belong to the chapters 84 and 85 during 2015 to 2019. The policymakers could explore ways to maintain the export competitiveness of CSGs by reducing the logistics or transaction costs (by lowering customs procedures), providing financial incentives under the scheme RODTEP, i.e., remission of duties and taxes on exported products, introduced in the year 2021. Also, the production of the sub-categories of CSGs with positive and high export growth could be promoted to escalate the value chain. The competitive exports of CSGs can contribute towards environmentally or climate-friendly markets.

Declaration of Competing Interest

The authors declare no competing interests.

References

1. Ahmad, I., Kunroo, M. H., & Sofi, I. A. (2018). An RCA Analysis of India–China Trade Integration: Present, Potential and Prospects. *Foreign Trade Review*, 53(1), 49-58.
2. Alavi, R. (2007). *An Overview of Key Markets , Tariffs and Non-tariff Measures on Asian Exports of Select Environmental Goods*. International centre for Trade and Sustainable Development (Issue 4).
3. Chowdhury, T., & Islam, A K. M. N. (2018). China's Trade in Climate Smart Goods: An Analysis of Trends and Trading Patterns. *Environmental Economics*, 9(3), 12–22. [https://doi.org/10.21511/ee.09\(3\).2018.02](https://doi.org/10.21511/ee.09(3).2018.02)

4. Dinda, S. (2018). *Growing Potential Business opportunity for Climate Friendly Goods and Technologies in Asia since 1997*. MPRA Paper No. 93238. Available at: <https://mpra.ub.uni-muenchen.de/93281/>
5. Directorate General of Foreign Trade (2015). *Foreign Trade Policy 2015-20*. Ministry of Commerce and Industry, Government of India.
6. Export-Import Bank of India, 2017. *Trade in Environmental Goods: A Perspective*. EXIM Bank Working Paper 69.
7. Available at: <https://www.eximbankindia.in/Assets/Dynamic/PDF/Publication-Resources/ResearchPapers/87file.pdf>
8. Krugman, P. R., Obstfeld, M., & Melitz, M. (2014). *International Economics: Theory and Policy*. Pearson Education, India.
9. Mathur, S. K. (2014). Trade in Climate Smart Goods of Ecuador: Quantitative Analysis Using Trade Indices, Smart and Gravity Analysis. *European Scientific Journal*, 1. [Special Issue].
10. Maryam, J., & Mittal, A. (2019). An empirical analysis of India's trade in goods with BRICS. *International Review of Economics*, 66(4), 399–421. <https://doi.org/10.1007/s12232-019-00328-7>
11. United Nations Economic and Social Commission for Asia and the Pacific (2011) *Climate-Smart Trade and Investment in Asia and the Pacific: Towards a Triple-Win Outcome*. Available at: <https://hdl.handle.net/20.500.12870/3078>

Annexure I

Table 3: List of Climate Smart Goods (UNESCAP List)

Sr. No.	HS 6-digit	Description
1	380210	Activated carbon
2	392690	Articles of plastics and arts. of other materials of 39.01-39.14, n.e.s. in Ch. 39
3	392010	PVC or polyethylene plastic membrane systems to provide an impermeable base for landfill sites and protect soil under gas stations, oil refineries, etc. from infiltration by pollutants and for reinforcement of soil
4	560314	Non-wovens, whether or not impregnated, coated, covered or laminated, of manmade filaments; weighing more than 150 g/m ² for filtering wastewater
5	700800	Multiple-walled insulating units of glass.
6	701931	Thin sheets (voiles), webs, mats, mattresses, boards and similar nonwoven products.
7	730820	Towers and lattice masts for wind turbines
8	730431	Tubes, pipes and hollow profiles (excl. of 7304.10-7304.29), seamless, of circular cross-section, of cold-drawn/cold-rolled (cold-reduced) steel.
9	730441	Tubes, pipes and hollow profiles (excl. of 7304.10-7304.39), seamless, of circular cross-section, of stainless steel, cold-drawn/cold-rolled (cold-reduced).
10	730451	Tubes, pipes and hollow profiles (excl. of 7304.10-7304.49), seamless, of circular cross-section, of alloy steel other than stainless steel, cold-drawn/cold-rolled (cold-reduced).
11	730900	Containers of any material, of any form, for liquid or solid waste, including municipal or dangerous waste.
12	732111	Solar-driven stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas-rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel.

13	732190	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas-rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel.
14	732490	Water-saving showers.
15	761100	Aluminium reservoirs, tanks, vats and similar containers for any material (specifically tanks or vats for anaerobic digesters for biomass gasification).
16	761290	Containers of any material, of any form, for liquid or solid waste, including municipal or dangerous waste.
17	840219	Vapour-generating boilers, not elsewhere specified or included, hybrids
18	840290	Super-heated water boilers and parts of steam-generating boilers.
19	840410	Auxiliary plants for steam, water and central boilers
20	840490	Parts for auxiliary plant for boilers, condensers for steam, vapour power unit.
21	840510	Producer of gas or water gas generators, with or without purifiers.
22	840681	Turbines, steam and other vapours, more than 40 MW, not elsewhere specified or included
23	840682	Steam turbines and other vapour turbines (excl. those for marine propulsion), of an output not >40 MW.
24	841011	Hydraulic turbines and water wheels of a power not exceeding 1,000 kW.
25	841012	Hydraulic turbines and water wheels, of a power >1,000 kW but not >10,000 kW
26	841013	Hydraulic turbines and water wheels, of a power >10,000 kW.
27	841090	Hydraulic turbines and water wheels; parts, including regulators.
28	841181	Gas turbines of a power not exceeding 5,000 kW
29	841182	Gas turbines of a power exceeding 5,000 kW
30	841581	Compression type refrigerating, freezing equipment incorporating a valve for reversal of cooling/heating cycles (reverse heat pumps).
31	841861	Compression type refrigerating, freezing equipment incorporating a valve for reversal of cooling/heating cycles (reverse heat pumps).
32	841869	Compression type refrigerating, freezing equipment incorporating a valve for reversal of cooling/heating cycles (reverse heat pumps).
33	841919	Solar boiler (water heater)
34	841940	Distilling or rectifying plants
35	841950	Solar collector and solar system controller, heat exchanger
36	841989	Machinery, plant or laboratory equipment whether or not electrically heated (excluding furnaces, ovens etc.) for treatment of materials by a process involving a change of temperature.
37	841990	Medical, surgical or laboratory stabilizers
38	842129	Filtering/purifying mach. and app. for liquids (excl. of 8421. 21-8421.23).
39	842139	Filtering/purifying mach. and app. for gases, other than intake air filters for int. comb. engines.
40	848340	Gears and gearing and other speed changers (specifically for wind turbines).

41	848360	Clutches and universal joints (specifically for wind turbines).
42	850161	AC generators not exceeding 75 kVA (specifically for all electricity generating renewable energy plants).
43	850162	AC generators exceeding 75 kVA but not 375 kVA (specifically for all electricity-generating renewable energy plants).
44	850163	AC generators not exceeding 375 kVA but not 750 kVA (specifically for all electricity-generating renewable energy plants).
45	850164	AC generators exceeding 750 kVA (specifically for all electricity generating renewable energy plants).
46	850231	Electric generating sets and rotary converters; wind-powered.
47	850680	Fuel cells using hydrogen or hydrogen-containing fuels such as methane to produce an electric current, through an electrochemical process rather than combustion.
48	850720	Other lead acid accumulators
49	853710	Photovoltaic system controller
50	853931	Discharge lamps (excluding ultraviolet), fluorescent
51	854140	Photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes.
52	850239	Electric generating sets n.e.s. in 85.02.
53	850300	Parts suitable for use solely/principally with the machines of 85.01/85.02.
54	850440	Static converters
55	890790	Floating structures other than inflatable rafts (e.g. rafts (excl. inflatable), tanks, coffer-dams, landing-stages, buoys and beacons).
56	847989	Machines and mech. applications having individual functions, n.e.s./included in Ch. 84.
57	900190	Mirrors of other than glass (specifically for solar concentrator systems)
58	900290	Mirrors of glass (specifically for solar concentrator systems).
59	902830	Electricity meters, incl. calibrating meters therefore
60	903020	Cathode-ray oscilloscopes and cathode-ray oscillographs.
61	903031	Multimeters.
62	903039	Instruments and app. for measuring/checking voltage/current/resistance/ power (excl. 9030.31), without a recording device.
63	903210	Thermostats.
64	903220	Manostats.

Source: United Nations Economic and Social Commission for Asia and the Pacific, 2011.

