
**Trade and sustainable development:
a case study of India-us solar trade dispute**

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ABSTRACT: It has been believed by economists that trade augurs well for income growth, which in turn, supports sustainable development. The United Nations Framework Convention on Climate Change (UNFCCC) has prompted nations to create “mandatory renewable energy targets”, by taking into account the goal of sustainable development. One of the prominent sources of renewable energy is solar energy. In view of the push towards cleaner and greener alternatives of energy, renewable energy has emerged as a significant space of trade animosity. Objectives are to establish the link between trade and sustainable development and to examine the impact of solar trade dispute on the overall bilateral trade between India and United States of America (US). Methodology includes elucidating the timeline of India-US solar power dispute. Further, qualitative (case study) as well as quantitative analyses are done using secondary data. This is to find out if there has been any impact of this dispute on the total trade between the said countries, on a pre- and post-dispute basis (from 2008-2012 and 2013-2017, with the year 2013 as the mid-point, as it is co-terminus with the initiation of the dispute). The bone of contention was the accusation made by US that India was making use of locally-procured Photo-Voltaic (PV) cells under the Jawaharlal Nehru National Solar Mission (JNNSM) for the installation of solar panels. US stated that India’s Domestic Content Requirement (DCR) includes discrimination against solar equipment produced abroad. Furthermore, US contended that subsidies were being given to solar power producers who employed domestically produced equipment. Expected result is to glean trade balance and ties between India and USA.

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Keywords: *Trade, sustainable development, renewable energy, solar trade dispute, India-US trade.*

Introduction

The 2030 Agenda for Sustainable Development recognizes international trade as an engine for inclusive economic growth and poverty reduction and a significant bid to achieve the Sustainable Development Goals (SDGs). There is provision for, and updating of, trade-related Global Indicators of SDGs, viz. SDG targets 17.10, 17.11 and 17.12 by the United Nations Conference on Trade and Development (UNCTAD), together with International Trade Commission (ITC) and World Trade Organization (WTO). SDG 17 recognizes trade as a means of implementation for the 2030 Agenda.

The targets outlined as part of this SDG include the following: necessitating nations to foster a universal, rules-based, open, non-discriminatory and equitable multilateral trading system; increase of exports of developing countries; doubling the share of exports of Least-Developed Countries (LDCs); implementing duty-free and quota-free market access for LDCs with transparent Rules of Origin (RoO) for exported goods. WTO is the vital medium for delivering these goals (Source: www.wto.org)

The Third International Conference on Financing for Development-the Addis Ababa Action Agenda identifies international trade as an instrument for inclusive growth, in addition to poverty reduction and a mechanism to achieve SDGs. As trade is not an end in itself, there is no separate SDG goal for trade. Nonetheless, as per economists, trade has been identified as one which can play a pivotal role in income growth and thereby social overheads and sustainable development. There are many instances of the assistance given by UNCTAD to trade and SDGs, some of which include: Helping Peru preserve and gain from its biodiversity, by applying Nagoya Protocol (March 2016); making fisheries more sustainable (September 2016); collaboration with Islamic Development Bank to support National Green Export Review in Senegal (November 2016); launch of projects in Vanuatu to examine its green export potential (March 2017). (Source: <http://unctad.org>)

India's trade policy moved from one of import substitution to export promotion over the years. As of now, there are many schemes such as Atmanirbhar Bharat Abhiyan (for self-reliant India), Production-Linked Incentive (PLI) scheme, Make in India and Make in India for the world.

Solar power converts renewable energy from the sun into electricity either directly through photovoltaic or indirectly via concentrated solar power. The products directly or indirectly powered by sunlight are called solar-based devices, the names of which are given as below:

Solar pump, solar charger, solar dryer, solar water heater and solar lamp. Solar controller and solar structure are not solar power-based devices. Solar panels, on the other hand, are made of solar cells and are connected in series. They are made of semiconductor material that converts sunlight into electrical energy.

Objectives:

They include the following:

- To establish the link between trade and sustainable development and
- To examine the impact of the trade dispute on the overall bilateral trade between India and the United States of America (US).

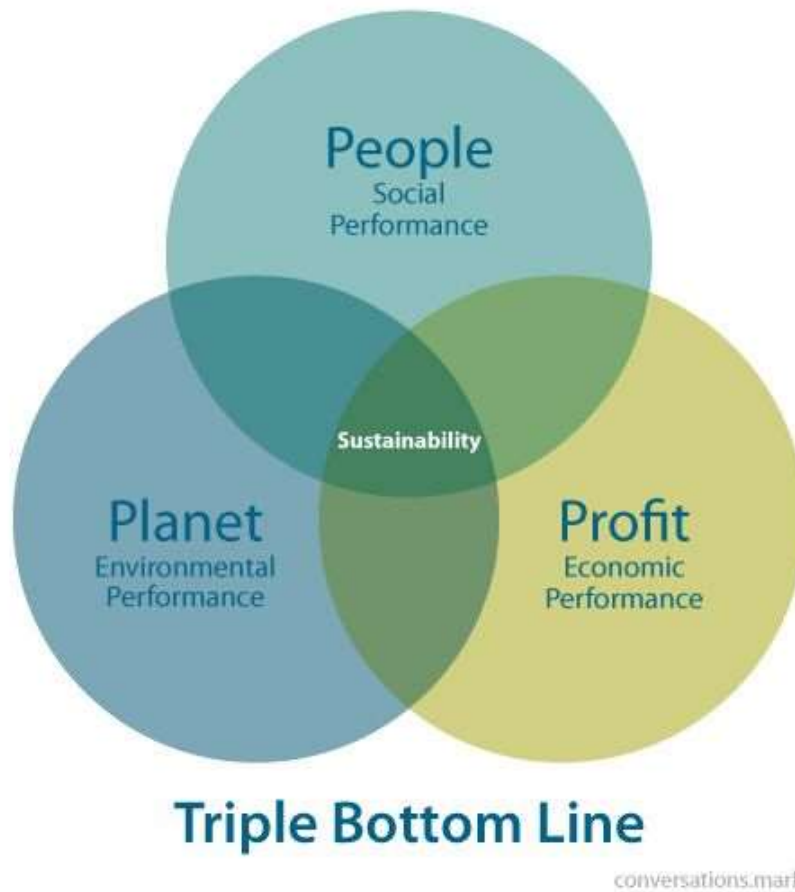
Research Context:

Certain landmark cases of the relation between international trade and environment include the tuna-dolphin dispute between the US and Mexico, the shrimp-turtles case, the US law regarding recycling of newsprint and its impact on the Canadian producers of pulp and newsprint. The *modus operandi* by which trade can lead to the fulfilment of Sustainable Development Goals (SDGs) is through four Ps, viz., Productivity, People-orientation, tackling Poverty and Planet-friendliness. This, in other words, is Triple Bottomline, in addition to reduction of poverty. One of the principal areas of discussion was sustainable development in the meeting of World Trade Organization (WTO) held in June 2018 at Geneva.

The significant role played by the WTO in encountering environmental degradation of oceans, is underscored under SDG # 14 (life below water). In December 2017, the decision on fisheries subsidies taken by WTO is a positive one and is in accordance with this SDG. As per this decision, members are supposed to prohibit subsidies that lead to over-capacity and over-fishing. Moreover, the subsidies which contribute to illegal and unreported fishing that is not regulated, are to be eliminated. However, there is 'Special and Differential Treatment' for developing countries and Least-Developed Countries (LDCs).

The US has stated that the various schemes under the Foreign Trade Policy of India are tantamount to subsidies given to Indian exporters. The WTO obligates that exports are not to be subsidised as they distort global trade. In view of this, many export promotion schemes in India have been modified from time to time, in order to comply with the WTO mandate. The schemes which were called up for consultation (the first step in WTO dispute settlement process) are the Merchandise Exports from India Scheme, Export Oriented Units Scheme and sector-specific schemes that include Electronics Hardware Technology Parks Scheme, Special Economic Zones and Export Promotion Capital Goods Scheme.

The solar power is growing fast in India. The government has its aim to promote the sustained development in various innovative solar projects. The Ministry of New and Renewable Energy aims to promote solar energy and thereby solar projects. A Venn diagram highlighting the Triple Bottomline is given below.



Source: <https://inchainge.com/knowledge/sustainability/what-do-we-know-about-the-triple-bottom-line/>

India's solar installed capacity was 67.82 GW as on 31 May 2023. India has a target of creating 280 GW of solar power capacity by 2030, out of the 500 GW of power from non-fossil fuels. In September 2022, Government of India approved the Production-Linked Incentive (PLI) Scheme for high-efficiency solar photo-voltaic panels. It has its aim as providing incentives to enterprises for sales of domestically produced solar equipment and thereby strengthen the Atmanirbhar Bharat Abhiyan initiative. Renewable sources make up 121 GW of India's 411 GW of power generation capacity (Source: The Economist, February 2023).

Brief Literature Review:

Hoekman and Kostecki (2001) brought out, through a multi-disciplinary approach, the fundamental mechanics of global trading order, which intertwine economic, institutional and

political issues. Sharma, *et al.* (2012) outlined that the 2007 Semiconductor Policy incorporated a capital subsidy of 20% for manufacturing units in Special Economic Zones (SEZs) and 25% for those outside SEZs. Rubini (2014) brought out the significance of methodology in legal analysis in general and veracity, lucidity and validity of the application of recent litigation on subsidies regarding renewable energy in WTO. The distinction between ‘good’ and ‘bad’ policies is to be done by adjudicators. The change in course of action is that the fine-tuning of legal interpretation may be more pervasive than the case at hand. They may have ramifications for the legal system as a whole. Lewis (2014) dwelt upon the determinants of renewable energy-related disputes, viz. the growing renewable energy industry, enhanced role of emerging markets, notably China; the imbalances between producers and users of renewable energy and increasing number of locally-owned technology firms in critical markets.

Ferris (2015) examined the solar cells case of India-US and the US-Countervailing duty measures on certain products from China. The trade mandates, as given in GATT and ASCM, ensure that countries will neither confer an undue benefit to their respective solar industries by stopping foreign solar products, nor give unnecessary subsidies, which are trade-distorting. Chaudhary, *et al.* (2015) brought out that there was limited focus on research and development in an organized manner. Indian companies relied on firmly proven technologies from abroad to build their products. Asmelash (2015) brought out the rationale behind susceptibility of renewable energy subsidies to WTO disputes, in comparison to fossil fuel subsidies.

Mathews (2016) stated that, in the recent past, trade in clean technology goods and the boost to industries in clean technology are on the rise. Reconciling the interests of UNFCCC and WTO is gaining traction. This requires different methods in order to facilitate trade to include strategies for the development of green industry. The inextricable link between fair trade and climate change requires recognition at a mutual level and coordination.

De Graaf and Asselt (2017) touched upon the energy subsidy regime complex. In other words, they have important questions for international trade, climate change, energy subsidy and economic development. They raised questions, which require additional investigation, viz. definition of energy subsidies is not so easy as compared to agricultural or fisheries subsidies; role of RTAs w.r.t. energy subsidies and whether existing fossil fuel subsidies are compatible with WTO law. Issac and Menon (2017) gave a broad brush of the nitty-gritties of the dispute and dwelt upon the arguments of India and US before the Appellate Body. They highlighted the need for simplicity, transparency and consistency in legal and dispute resolution mechanisms. Helble and Shepherd (2017) brought to light the triple-win scenario, wherein conducive trade policies promote international trade, thereby leading to results that are

supportive of development, as well as accomplishment of SDGs. This book is sub-divided into many parts, encompassing the following:

- a) Poverty, hunger and inclusive growth (that include trade and poverty reduction, agricultural trade and hunger, trade and women, employment, inequality);
- b) Sustainable growth (that includes trade and environment, climate change, sustainable fisheries, trade and water nexus, trade, labelling and food safety);
- c) Trade and education/health (that include trade in education services and SDGs, trade in medical products and pharmaceuticals, trade in health services) and
- d) Other linkages between trade and SDGs (trade and urbanization, trade, infrastructure and development, facilitating trade for development: aid for trade).

Bansal and Deshpande (2017) sought to justify the potential violation of Agreement on Subsidies and Countervailing Measures (ASCM) that employ environmental exceptions under Article XX of GATT. They argued that exceptions under Article XX of GATT are to be applied to ASCM that are potentially violated by subsidies in renewable energy. Moreover, they discussed ramifications for Indian renewable energy sector to strike a balance between free trade and right of countries to regulate environmental issues. Shadikhodjaev (2017) dealt with the ruling of Appellate Body of WTO, which upheld the decision of the Panel. It was that the measures of Indian government violated international trade obligations. The said decision opens new vistas regarding exceptions for environmental policies under WTO. Furthermore, it focuses on the significance of other international legal order as regards compliance under WTO. There is scope for enhancing export avenues of many countries in the Indian renewable energy market.

Duran (2018) argued that the two systems of subsidy control (viz., WTO's Agreement on Subsidies and Countervailing Measures (ASCM)) and European Union's system for renewable energy aid differ both substantively and procedurally. The key takeaway for WTO from EU's regulatory provisions is the need to enhance transparency and knowledge-improvement of its subsidy regime. Karttunen and Moore (2018) stated that the solar trade dispute is one among an increasing number of disputes under the WTO, which underscore the friction between climate change initiatives in general and renewable energy in particular and the set multilateral trading system on the other side. They argued that the decision of Appellate Body was justified both on economic and legal fronts. Ghori (2018) stated that subsidies and other governmental incentives frequently distort trade. He dwelt upon the current law on subsidies, which was extended to attain environmental objectives, with the Canada-Renewable Energy/Feed-in tariff

case and the subsequent India-solar cells case. He elucidated possible reform in GATT/WTO framework to promote renewable energy, whilst preserving systemic integrity.

Chawla (2018) opined that the political economy of energy sector at a general, international level and specifically about renewable energy will gain a lot of currency in the near future. India is slated to be among the largest and most dynamic markets globally as regards renewable energy. The success of this sector is a function of determinants such as; *inter alia*, energy accessibility and climate change. The ramifications of increased emphasis on renewable energy are energy security on the one hand and bilateral and multilateral cooperation in the energy front, on the other. As per Fang (2019), the numerous trade disputes under the regime of WTO are part of the compatibility of trade and climate regimes. This author studied the provisions of WTO regarding the legality of renewable energy-related issues. It relates to Article III: 8 (a), which was pivotal both in Canada-Renewable Energy and India-Solar cells dispute. The said author was of the view that the methodology used by WTO Panel in the former dispute is more in sync with the essence of the said Article. As per the report of International Renewable Energy Agency (IRENA) of 2019, there needs to be a policy framework for a just transition, covering the gamut of deployment, integrating and enabling policies. This is regarding the future of Solar Photo-voltaic. Enhancement of Solar PV energy outlay is of paramount importance to accelerate the growth of installations. There are innovations across the entire value chain of Solar PV industry. There is a lot of scope of Solar PV in achieving climate targets, i.e. to contain the rise in global temperature in 21st century below 2 degrees Celsius and closer to the 1.5 degrees Celsius compared to those in pre-industrial era.

Hajdukiewicz and Pera (2020) proved the relation between protectionist policy resulting in trade conflicts and export competitiveness. They explored trade disputes concerning photo-voltaic products in WTO during 2007-18. Ghosh (2020) put forth that the annual Greenhouse Gas (GHG) emissions of India are globally the third highest, notwithstanding the fact that India's per capita emissions of carbon dioxide are very low. Fourteen cases were identified, which deal with various aspects of climate change. The role of National Green Tribunal (NGT) was underscored. Indian environmental verdicts frequently depend on international environmental law in the course of interpreting statutory obligations. There are systemic issues that relate to Indian legal system, which have an impact on the environment and climate too.

Bazilian, *et al.* (2020) analysed three markets in renewables, which have local content requirements and if they have enabled the creation of local manufacturing capacity or if local companies gained from them. It was done for Brazilian, Indian and South African markets. The finding was that companies in all the above countries had proclivity to assume roles that

originated from other industries, such as project development or ancillary services. Moreover, Local Content Requirements (LCR) led to higher project costs.

Behuria (2020) highlighted that, based on the India-Solar cells case, the nations which do not integrate an emphasis on manufacturing in their strategies for renewable energy from the beginning may have to depend upon foreign imports of such technologies in the long run. There would be green division of labour, in the sense that Global South depends on technology from the US, Europe and East Asia.

The recommendations of WTO on ways and means to further the advancement of realizing the SDGs are as under:

- a) Mainstream trade has to go into national and sector strategies to attain SDGs.
- b) The multilateral trading system to be bolstered in order to further support, *inter alia*, inclusive growth.
- c) Trade costs are to be lowered by the complete implementation of WTO's Trade Facilitation Agreement.
- d) Capacity on the supply side and the support infrastructure for trade are to be built up in developing and LDCs.
- e) Diversification and value addition of exports needs to be done.
- f) Services sector is to be augmented.
- g) Flexible Rules of Origin are to be applied, in order to enhance the execution of preference schemes.
- h) Ensure that Non-Tariff Measures are not barriers to trade.
- i) E-commerce is to be a catalyst for inclusive growth.
- j) Micro, Small and Medium Enterprises (MSMEs) are to be given support, such that they too can participate in global trade.

The report of IMF, OECD, World Bank and WTO (2022) dealt with the on-going global economic challenges which are resulting in new debates about the role of subsidies. They are digitalization, climate change, emergency support, resilient global supply chains and changing role of state. They stated that information on subsidies is found wanting. They brought out the prevalence of below market financing. It exists mainly in heavy industries, where the build-up of capacity apparently is more than the justifiable level, based on market conditions. *Inter alia*, half the firms dealing with solar photovoltaic panels seemingly gained from below-market borrowings over the period 2005-19.

Backdrop:

India launched its National Solar Policy, the Jawaharlal Nehru National Solar Mission (JNNSM) on 11 January 2010. There are two components in Phase I of that policy, viz. Batch 1 and Batch 2. As part of Batch 1, India required developers of solar photovoltaic (PV) projects that employ crystalline silicon technology to use solar modules which are manufactured in India. Later, under Batch 2, there was expansion of the said domestic sourcing requirement to crystalline silicon solar cells too, by India. Under the JNNSM, Government of India entered into power purchase agreements with solar power developers. Later, the power was sold to distribution utilities, which subsequently sell the power to end users.

Under Phase II of JNNSM, India stated that it is broaching the expansion of scope of Domestic Content Requirements (DCR), which includes solar thin film technologies. These, at that point of time, comprise the lion's share of solar exports of the US to India.

Furthermore, India offers the developers of solar energy who participate in the JNNSM, a guarantee that the government shall purchase a specified quantum of solar power at a highly subsidized tariff rate, if they use solar equipment that is manufactured domestically, in place of imports.

The aforementioned tenets of National Solar Policy of India are apparently not in consonance with its obligations under WTO Agreements.

Methodology:

The paper includes elucidating the timeline of India-US solar power dispute. Further, qualitative (case study) as well as quantitative analyses are done using secondary data. This is to find out if there has been any impact of this dispute on the total trade between the said countries, on a pre- and post-dispute basis (from 2008-2012 (pre-dispute) and 2013-2017 (post-dispute), with the year 2013 being co-terminus and co-extensive with the initiation of the dispute).

The null and alternative hypotheses are given as under:

H₀: Average trade balance Post-dispute is lesser than Average trade balance Pre-dispute.

H₁: Average trade balance Post-dispute is equal to Average trade balance Pre-dispute.

Link between trade and sustainable development:

Goal 7 of SDGs is concerned with the provision of accessibility to affordable, reliable and sustainable energy for all the citizens. The sub-goals aim at the following:

Ensuring universal access to affordable, reliable and modern energy services;

Substantial increase in the share of renewable energy in the global energy mix; and

Doubling of the global rate of improvement in energy efficiency by 2030.

Further, they underscored the need to enhance international cooperation to facilitate access to clean energy, research and technology, including renewable energy, energy efficiency and

advanced and cleaner fossil-fuel technology and promote investment in energy infrastructure and clean energy technology.

The Sustainable Development Indicators of Goal 7 relate to the proportion of population with access to electricity; that with primary reliance on cleaner fuels and technology; renewable energy share in total final energy consumption; energy intensity in terms of primary energy and GDP; international financial flows to developing countries in support of clean energy research and development and renewable energy production.

Source: Collated from www.unstats.un.org

Brief tenets of the case:

The bone of contention was the accusation made by US that India was making use of locally-procured Photo-Voltaic (PV) cells under the Jawaharlal Nehru National Solar Mission (JNNSM) for the installation of solar panels. In other words, there was stipulation that power producers under the said Mission must mandatorily procure a portion of solar panels and modules for the projects from domestic manufacturers. The complaint lodged by US stated that India's Domestic Content Requirement (DCR) includes discrimination against solar equipment produced abroad. In addition to this, US contended that subsidies were being given to solar power producers who employed domestically produced equipment.

In February 2013, US requested consultations with India relating to DCR under JNNSM for solar cells and modules. In September 2016, the Appellate Body (AB) of WTO ruled in favour of US. It upheld the Panel's finding regarding the inconsistency of DCR measures with the non-discrimination principle of GATT and the 'National treatment' provision, mandated under Trade-Related Investment Measures (TRIMs). The precedent w.r.t. similar concerns (i.e. invoking provisions of ASCM, GATT and TRIMs) is the 'Canada-Renewable Energy'/'Canada-Feed-in Tariff Program' case (2011), where the product which was being procured (i.e. electricity) was not in a "competitive relationship" with the product in question (solar cells and modules). Appellate Body concurred with the Panel that the solar cells and modules were not "products in general or local short supply" and therefore, the DCR initiatives do not hold good.

The deadline for India to meet the recommendations of the Dispute Settlement Body (DSB) was 14 December 2017. India reported that it had complied with the recommendations. However, US was of the view that India had not implemented those recommendations and sought to take recourse to countermeasures. In February 2018, DSB conceded the setting up of compliance panel at the behest of India.

The impact of the trade dispute between India and US is a pan-industry one, wherein the tremors would be felt on different levels of industry, viz., large, medium and small. With respect to subsidies and DCR being given by 8 states of US, especially to solar products, India has gone in for a trade dispute against US in WTO.

Details of the dispute:

Complainant: USA

Articles involved: Article III: 4, III: 8 (a), XX (d), XX (j), TRIMs

Respondent: India

TABLE 1: TIMELINE OF THE DISPUTE

Request for consultations by US with India	6 February 2013
Request for supplementary consultations	10 February 2014
Request for establishment of a Panel	14 April 2014
Deferring of establishment of panel by DSB	25 April 2014
Establishment of Panel	23 May 2014
Composition of Panel after agreement by parties	24 September 2014
Circulation of Panel report	24 February 2016
Notification by India to DSB of its decision to appeal to Appellate Body (AB, which is WTO's highest court)	20 April 2016
Circulation of AB Report (AB upheld the ruling that India violated many fundamental tenets on National treatment and TRIMs)	16 September 2016
Adoption of Appellate Body report and Panel report by DSB	14 October 2016
Intimation by India to DSB that it intended to implement DSB's recommendations and rulings in the dispute	8 November 2016
Intimation by US and India to DSB that they had agreed to deadlines for arbitration	1 December 2016
DSB agreed to establish a panel to look into the allegations raised by India w.r.t. 8 states in US.	21 March 2017
Intimation by India and US to DSB that the reasonable period of time to implement DSB's recommendations and rulings to be 14 months (from October 2016)	16 June 2017
Intimation by India to DSB that it ceased to impose any measures that are inconsistent with DSB's findings	14 December 2017

Request by US to DSB to suspend concessions or other obligations w.r.t. Art. 22.2, that India failed to comply with DSB's recommendations and rulings within reasonable period of time.	19 December 2017
Objection by India to US' contention (US had failed to enter into negotiations with India on a mutually acceptable compensation); India said that US' request is "vague and invalid".	3 January 2018
Tussle between US and India over US' decision to seek trade retaliatory measures, without having established that India failed to remove DCR for solar cells and solar modules by the deadline and referral of the issue to arbitration under Art. 22.6 of Dispute Settlement Understanding (DSU)	12 January 2018
Request by India to establish Compliance Panel as per Art. 21.5 of DSU.	23 January 2018
Deferral of establishment of Compliance Panel by DSB	9 February 2018
Agreement by DSB to refer to the original panel, if possible, the issue raised by India	28 February 2018
Circulation of panel report entitled 'US-Certain Measures relating to the Renewable Energy sector'	27 June 2019
Notification by India to DSB of its decision to appeal to the AB, certain issues of law and legal interpretation covered in the panel report circulated on 27 June 2019	22 August 2019

Source: Collated from www.wto.org

Measure and Product at issue:

Measure at issue: Domestic Content Requirements (DCR measures) imposed by India in the initial phases of Jawaharlal Nehru National Solar Mission (JNNSM) on solar power developers, who sell electricity to the Government.

Product at issue: Solar cells and /or modules used to generate solar power.

Summary of key findings of Panel/Appellate Body:

GATT III: 4 and TRIMS Art. 2.1 (National treatment):

The Appellate Body upheld the finding of the Panel, which was that DCR measures of India were not consistent with WTO non-discrimination obligations under the aforementioned articles.

Article 2.1 of TRIMS prohibits trade-related measures, which are inconsistent with GATT Article III.

Article 3.1(b), 3.2 of WTO Agreement on Subsidies and Countervailing Measures (SCM Agreement), prohibits condition that a subsidy being given for domestic goods instead of imports and Article 5 of the SCM Agreement that prohibits causing adverse effects on other WTO members via subsidies which discriminate against imports.

GATT Article III: 8 (a) (government procurement derogation): There was conclusion by the Appellate Body that the Panel was guided appropriately by its report in Canada-Renewable Energy case, in proving that the measures were not covered by the derogation as under Article III: 8 (a) as the product being procured (electricity) was not in any “competitive relationship” with the product in question and discriminated against (solar cells and modules). India’s contention that the Panel acted inconsistently with Article 11 in terms of assessment of India’s arguments with respect to the scope of Article III:8 (a).

GATT Article XX (d): (General exceptions –necessary to secure compliance with laws: The Appellate Body was in consonance with the finding of the Panel that India had not demonstrated that its measures were justified under Article XX (d). Against this background, India neither proved that the domestic instruments that were being put to question and were challenged set out a rule to ensure ecologically sustainable growth, nor proved that the international instruments examined were under the purview of Article XX (d).

GATT Article XX (j) (General exceptions –essential to acquisition or distribution of products in general or local short supply): The Appellate Body upheld the finding of the Panel that solar cells and modules were not “products in general or local short supply” within the sense contained in Art. XX (j) and that DCR measures were not justifiable as per the said provision. As per the Appellate Body, an evaluation of whether goods are in short supply, should take stock of all relevant factors, such as the quantity of the product made available through domestic and international sources, potential price fluctuations in the relevant market and purchasing power of consumers, be they domestic or foreign.

As part of the rebuttal, India’s contention was that US did not follow the “critical” steps which are elucidated under the dispute settlement understanding before it had initiated the request for authorization to suspend trade concessions. India stated that the parties had to negotiate to agree on compensation that was mutually acceptable. It was a requirement as regards the rules for compensation when there is non-implementation of DSB recommendations.

WTO stated in a Panel report, after having given its ruling that “The DCR measures are inconsistent with Article 2.1 of the TRIMs Agreement and Article III: 4 of the GATT, 1994 and are not covered by the derogation in Article III: 8 (a) of GATT, 1994 and are not justified under the general exceptions in Article XX (j) or Article XX (d) of GATT, 1994”.

The US was of the view that India could attain its end of clean energy at a greater pace and lower cost via the entry of US-based solar technology imports. In February 2016, WTO ruled against India for violating GATT and TRIMs. At that time, some industry experts opined that the WTO ruling was at such a stage when the Indian solar manufacturers were already fraught with constraints such as declining prices of solar panels across the world, slowing demand abroad and competition from low-priced imports from China domestically.

According to the then US Trade Representative Mr. Ron Kirk, US strongly supports the deployment of solar energy around the world, including with India. However, there was apparent discrimination in India’s program by requiring solar energy producers to use Indian-manufactured solar cells and modules and by proffering subsidies to such developers who domestic equipment in place of imports.

It was the second time that a request was filed by India to assess its compliance measures in trade disputes launched by the US against India. Hitherto, India had requested for a compliance panel to establish whether it had complied with WTO’s rulings in the avian flu trade dispute relating to the import of chicken and chicken products from the US.

The impact of the trade dispute between India and US is a pan-industry one, wherein the tremors would be felt on different levels of industry, viz. large, medium and small. Moreover, this is bound to have repercussions on exports not merely to the US, but to the global market as well. The types of action include imposition of 30% safeguard duties on imported solar cells and duties of 20-50% on imported large residential washers as per Section 301 of Dispute Settlement Understanding (DSU). On the other hand, South Korea, China and Singapore requested the US to discuss compensation mechanism for the injury to their solar cells' trade. The differences between the Indian and US solar programmes are as under: Unlike India's JNNSM, there is no solar policy run by the Central Government in the US, nor a national Renewable Purchase Obligation. In June 2019, dispute resolution panel of WTO gave its verdict in favour of India, against the US. Parties to a dispute can appeal against the verdict of a panel. However, appeals are to be based upon points of law and cannot re-open findings of the panel, based on fact. It cited that domestic content requirements and subsidies given by 8 states in US in the solar energy violate global trade norms. The 8 states that provided subsidies are Washington, California Montana, Massachusetts, Connecticut, Michigan, Delaware and Minnesota.

India contended that the measures were not in consonance with global trade norms as they provide less favourable treatment to imported products than ones produced domestically and furthermore, subsidies are conditional on the use of domestic rather than imported goods.

European Union, Brazil, China and Japan supported India regarding the solar panel dispute with the US. These countries opined that the demand for trade retaliatory measures by the US against India is not justified.

India appealed and requested the Appellate Body to reverse the findings of the Panel as regards errors of law and legal interpretation contained in the report. India's view was that the panel erred in holding that India did not make a *prima facie* case that "the Minnesota solar thermal rebate under measure 10 had on-going effects and therefore, constituted a matter before the panel that required examination in order to provide a solution to the dispute".

As part of the State visit of Honourable PM of India, Mr. Narendra Modi to the US in June 2023, both the countries have agreed to end six trade disputes between them and one of them is that relating to solar cells and modules. In July 2023, an official stated that India and US resolved the trade dispute mutually and had informed the WTO regarding the same.

Data Analysis:

For the products under the broad head 8419 of HSN, the average trade balance in USD thousand is presented below on a pre- (2008-12) and post-dispute (2013-17) basis.

TABLE 2: A FEW STATISTICAL MEASURES OF CHANGES & VARIABILITY IN TRADE BALANCE OF DIFFERENT PRODUCTS (PRE-DISPUTE)

Product code	Product label	2008	2009	2010	2011	2012
'841950	Heat-exchange units (excluding instantaneous heaters, storage water heaters, boilers and equipment ...	-8766	-7315	-16034	-19799	-14309
'841960	Machinery for liquefying air or other gases	-5270	345	219	-21579	-11122
'841990	Parts of machinery, plant and laboratory equipment, whether or not electrically heated, for ...	-10665	-7486	-10088	-27857	-36628
'841920	Medical, surgical or laboratory sterilizers	-7511	-1839	162	-3957	-4670
'841911	Instantaneous gas water heaters (excluding boilers or water heaters for central heating)	-71	-68	-189	48	-196
'841933	Lyophilisation apparatus, freeze drying units and spray dryers	0	0	0	0	0
'841935	Dryers, for wood, paper pulp, paper or paperboard (excl. lyophilisation apparatus, freeze drying ...	0	0	0	0	0
'841989	Machinery, plant or laboratory equipment, whether or not electrically heated, for the treatment ...	-15750	-12616	-28911	-14815	-19369
'841931	Dryers for agricultural products	-379	-102	0	-236	-2475

'841981	Machinery, plant and equipment for making hot drinks or for cooking or heating food (excluding ...	5984	-1585	-5068	-5879	-8853
'841912	Solar water heaters	0	0	0	0	0
'841919	Instantaneous or storage water heaters, non-electric (excl. instantaneous gas water heaters, ...	-146	-261	-84	-1059	-124
'841932	Dryers for wood, paper pulp, paper or paperboard	0	-4	0	0	-1469
'841939	Dryers (excl. lyophilisation apparatus, freeze drying units, spray dryers, dryers for agricultural ...	-1976	-2136	-3774	-3876	-7547
'841940	Distilling or rectifying plant	-1230	-1822	6632	-4788	-1244
'841934	Dryers, for agricultural products (excl. lyophilisation apparatus, freeze drying units and ...	0	0	0	0	0
	AVERAGE (Pre-Dispute)	-2861.25	-2180.56	-3570.94	-6487.31	-6750.38
	STD DEV	5374.28	3711.368	8464.457	9198.315	9943.71
	CV	-187.83	-170.202	-237.037	-141.789	-147.306

Source: Data from www.trademap.org and measures calculated by the researcher, data in USD thousand.

TABLE 3: A FEW STATISTICAL MEASURES OF CHANGES AND VARIABILITY IN TRADE BALANCE (POST-DISPUTE)

Product code	Product label	2013	2014	2015	2016	2017
'841950	Heat-exchange units (excluding instantaneous heaters, storage water heaters, boilers and equipment ...	-12242	965	325	475	17267
'841960	Machinery for liquefying air or other gases	-883	-483	-1724	-1333	-756
'841990	Parts of machinery, plant and laboratory equipment, whether or not electrically heated, for ...	-2178	-18331	434	4220	-3187
'841920	Medical, surgical or laboratory sterilizers	-2064	-2659	-3893	-5269	-4369
'841911	Instantaneous gas water heaters (excluding boilers or water heaters for central heating)	-494	604	1087	369	-353
'841933	Lyophilisation apparatus, freeze drying units and spray dryers	0	0	0	0	0
'841935	Dryers, for wood, paper pulp, paper or paperboard (excl. lyophilisation apparatus, freeze drying ...	0	0	0	0	0
'841989	Machinery, plant or laboratory equipment, whether or not electrically heated, for the treatment ...	-16966	-14664	-14893	-12209	-15301
'841931	Dryers for agricultural products	-34	6	233	321	-13

'841981	Machinery, plant and equipment for making hot drinks or for cooking or heating food (excluding ...	-7495	-17849	-7182	-5395	-5599
'841912	Solar water heaters	0	0	0	0	0
'841919	Instantaneous or storage water heaters, non-electric (excl. instantaneous gas water heaters, ...	81	1140	1710	1038	-168
'841932	Dryers for wood, paper pulp, paper or paperboard	0	-582	0	0	-1
'841939	Dryers (excl. lyophilisation apparatus, freeze drying units, spray dryers, dryers for agricultural ...	-7296	-578	-3487	-5331	-6803
'841940	Distilling or rectifying plant	-3806	-17	7656	1557	2560
'841934	Dryers, for agricultural products (excl. lyophilisation apparatus, freeze drying units and ...	0	0	0	0	0
	AVERAGE (Post-dispute)	-3336.06	-3278	-1233.38	-1347.31	-1045.19
	STD DEV	5122.306	6871.647	4777.714	3906.025	6475.307
	CV	-153.543	-209.629	-387.369	-289.912	-619.535

Source: Data from www.trademap.org and measures calculated by the researcher. Data is in USD thousand.

Trade in products under Harmonized System Nomenclature (HSN) 8419 was taken into account. There was no bilateral trade between India and US in solar water heaters (HSN 841912). As such, the values are given as zero. The broad product category is that of HSN 84 (Nuclear reactors, boilers, machinery, mechanical appliances and parts thereof) and within that, HSN 8419 (going more granular to the four-digit level). HSN 8419 corresponds to Machinery, plant or laboratory equipment whether or not electrically heated. When the term 'solar' was typed in the product tab of the website of Trademap (www.trademap.org), it returned two sub-categories, viz. 841912: Solar water heaters and 841919: Instantaneous or storage water heaters, non-electric (excluding instantaneous gas water heaters, solar water heaters and boilers or water heaters for central heating). As the aforementioned two product codes imply a very small sample size, the broader category of product code 8419 was taken as a representative sample. It deals with various forms of energy and the related machinery and mechanical appliances suited for them. It is pertinent in the context of renewed focus lately on renewable sources of energy on account of excess Greenhouse Gas (GHG) emissions.

The average trade balance from 2008 to 2012 was calculated and on a similar note, 2013 to 2017. The, standard deviation and Coefficient of variation (CV) were calculated on a pre-and post-dispute basis.

The average trade balance of the products under HSN 8419 during the period 2008-12 revealed the following. It increased in 2009, but declined continuously during the rest of the said period. Coming to the average values post-dispute, there was an increase for two years, followed by a slight decline and increase later.

Standard deviation of the sample was calculated. There was decline in 2009, but was followed by sharp increase in 2010 and a further rise in 2011. The rising streak continued, though not so pronounced in 2012. As regards the subsequent period, the initial increase in 2014 was followed by two consecutive declines and an increase later.

With respect to the former period, there were alternate increase and decrease in CV. In 2010, CV reached a low of -237%. The CV values are all negative as the average trade balance values are negative. In the latter period, there were major declines, with only the year 2015 witnessing an increase. In 2016, there was a precipitous fall to -619%. CV of the 8419 group of products increased during the period 2013-17 as compared to that in 2008-12, thereby indicating greater variability in trade balance of those products.

Growth rates of trade balance:

Growth rates of trade balance of products under HSN 8419 were calculated. It was done separately for the pre- and post-dispute periods of time. Growth rate was calculated as under:

Growth rate (pre-dispute) =

$$\frac{(\text{Value of trade balance in 2012} - \text{Value of trade balance in 2008}) * 100}{(\text{Value of trade balance in 2008})}$$

By the same token, growth rate in the post dispute period was calculated as follows:

Growth rate (post-dispute) =

$$\frac{(\text{Value of trade balance in 2017} - \text{Value of trade balance in 2013}) * 100}{(\text{Value of trade balance in 2013})}$$

The relevant tables are given below. The highest growth rate of 553% was registered for the product named dryers for agricultural products.

TABLE 4: GROWTH RATES OF TRADE BALANCE OF DIFFERENT PRODUCTS (PRE-DISPUTE)

Product code	Product label	2008	2012	Growth rate (%)
'841950	Heat-exchange units (excluding instantaneous heaters, storage water heaters, boilers and equipment ...	-8766	-14309	63.233
'841960	Machinery for liquefying air or other gases	-5270	-11122	111.04
'841990	Parts of machinery, plant and laboratory equipment, whether or not electrically heated, for ...	-10665	-36628	243.44
'841920	Medical, surgical or laboratory sterilizers	-7511	-4670	-37.825
'841911	Instantaneous gas water heaters (excluding boilers or water heaters for central heating)	-71	-196	176.06
'841933	Lyophilisation apparatus, freeze drying units and spray dryers	0	0	0
'841935	Dryers, for wood, paper pulp, paper or paperboard (excl. lyophilisation apparatus, freeze drying ...	0	0	0
'841989	Machinery, plant or laboratory equipment, whether or not electrically heated, for the treatment ...	-15750	-19369	22.978
'841931	Dryers for agricultural products	-379	-2475	553.03
'841981	Machinery, plant and equipment for making hot drinks or for cooking or heating food (excluding ...	5984	-8853	-247.94
'841912	Solar water heaters	0	0	0
'841919	Instantaneous or storage water heaters, non-electric (excl. instantaneous gas water heaters, ...	-146	-124	-15.068
'841932	Dryers for wood, paper pulp, paper or paperboard	0	-1469	0
'841939	Dryers (excl. lyophilisation apparatus, freeze drying units, spray dryers, dryers for agricultural ...	-1976	-7547	281.93
'841940	Distilling or rectifying plant	-1230	-1244	1.1382
'841934	Dryers, for agricultural products (excl. lyophilisation apparatus, freeze drying units and ...	0	0	0

Source: Data from www.trademap.org and growth rate calculated by the researcher, trade balance is in USD thousand.

TABLE 5: GROWTH RATES OF TRADE BALANCE OF DIFFERENT PRODUCTS

(POST-DISPUTE)

Product code	Product label	2013	2017	Growth rate (%)
'841950	Heat-exchange units (excluding instantaneous heaters, storage water heaters, boilers and equipment ...	-12242	17267	-241.05
'841960	Machinery for liquefying air or other gases	-883	-756	-14.383
'841990	Parts of machinery, plant and laboratory equipment, whether or not electrically heated, for ...	-2178	-3187	46.327
'841920	Medical, surgical or laboratory sterilizers	-2064	-4369	111.68
'841911	Instantaneous gas water heaters (excluding boilers or water heaters for central heating)	-494	-353	-28.543
'841933	Lyophilisation apparatus, freeze drying units and spray dryers	0	0	0
'841935	Dryers, for wood, paper pulp, paper or paperboard (excl. lyophilisation apparatus, freeze drying ...	0	0	0
'841989	Machinery, plant or laboratory equipment, whether or not electrically heated, for the treatment ...	-16966	-15301	-9.8137
'841931	Dryers for agricultural products	-34	-13	-61.765
'841981	Machinery, plant and equipment for making hot drinks or for cooking or heating food (excluding ...	-7495	-5599	-25.297
'841912	Solar water heaters	0	0	0
'841919	Instantaneous or storage water heaters, non-electric (excl. instantaneous gas water heaters, ...	81	-168	-307.41
'841932	Dryers for wood, paper pulp, paper or paperboard	0	-1	0
'841939	Dryers (excl. lyophilisation apparatus, freeze drying units, spray dryers, dryers for agricultural ...	-7296	-6803	-6.7571
'841940	Distilling or rectifying plant	-3806	2560	-167.26
'841934	Dryers, for agricultural products (excl. lyophilisation apparatus, freeze drying units and ...	0	0	0

Source: Data from www.trademap.org and growth rates calculated by the researcher, trade balance is in USD thousand.

Interpretation:

- i) The products which are **common in terms of their negative growth rates** or deceleration in the years taken into consideration for both pre -and post-dispute periods are as under:
- Machinery, plant and equipment for making hot drinks or for cooking and heating food.
 - Instantaneous or storage water heaters, non-electric.
- ii) The products with **zero value of trade balance and thereby zero growth rate** are as follows:
- Lyophilisation apparatus, freeze drying units and spray dryers;
 - Dryers for wood, paper pulp, paper or paper board;
 - Solar water heaters;
 - Dryers for agricultural products.
- iii) As regards the product named Dryers for wood, paper pulp, paper or paperboard, the trade balance in 2008 was zero and -\$1469000 in 2012. However, the value was zero in 2013 and -\$1000 in 2017.
- iv) The products which had **positive growth rate in the pre-dispute period, but negative growth rate in the post-dispute period** are as follows:
- Heat exchange units;
 - Machinery for liquefying air or other gases;
 - Instantaneous gas water heaters;
 - Machinery, plant or laboratory equipment, whether or not electrically heated for the treatment;
 - Dryers for agricultural products;
 - Dryers;
 - Distilling or rectifying plant.

Hypothesis testing:

t-Test assuming equal variance (homoscedasticity) was done. The result of t-Test is tabulated below.

TABLE 6: OUTPUT OF t-TEST

t-Test: Two-Sample Assuming Equal Variances		
	<i>AVERAGE (Pre-Dispute)</i>	<i>AVERAGE (Post-dispute)</i>
Mean	-4370.0875	-2047.9875
Variance	4464415.333	1333053.694
Observations	5	5
Pooled Variance	2898734.514	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-2.156486293	
P(T<=t) one-tail	0.031567043	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.063134086	
t Critical two-tail	2.306004135	

Source: Calculated by the researcher in MS-Excel

The Mean or Average value of trade balance has increased as it is negative. The p value of one-tailed test is 0.03, which is lesser than 0.05 (Level of significance or α). As such, the null hypothesis is to be rejected. In other words, the average trade deficit has reduced in the period subsequent to the dispute.

Conclusion and Scope for further research:

To sum up, the average trade balance declined in the last 3 years of the period 2008-12, with an almost similar pattern in the period 2013-17, but for a marginal decline in 2016. Regarding standard deviation, the values in the period 2008-12 are higher than those during 2013-17 except in 2009, when the value was lower at 3711. With regard to Coefficient of Variation, there is a greater variability in the latter period. There are many products which were in the positive growth territory in the pre-dispute period, but later slipped into deceleration phase in the post-dispute period. This is a pointer to the wide fluctuations in trade balance in the overall period.

There needs to be holistic view of SDGs and that international trade can augur well for a cluster of them, viz., clean water and sanitation: Goal #6; affordable and clean energy: Goal #7; sustainable cities and communities: Goal # 11; responsible consumption and production: Goal #12; life on land: Goal #15 and partnership for the goals: Goal #17. The trade-environment trade-off needs to be set aside and the productivity should usher in trade policies which are in the best interests of people and planet too.

This paper takes stock only of the solar power trade dispute between India and US. It has been reported that the US too is involved in the provision of subsidies to its domestic producers, which warrant further scrutiny. As such, there could be a comparative study on the subsidy programmes of India vis-à-vis the US.

The following scheme cleared by the US Congress has the potential to help exporters. Those exporters in the US that create an IC-DISC (interest charge domestic international sales corporation) can have not merely tax savings, but also relatively low initial costs. There is a need for further study as to whether this scheme potentially subsidises exports of US to other markets. Furthermore, it needs to be studied if the gains, which individual state in the US may be providing manufacturers who lend competitive advantage.

There could be a thorough review of the current export promotion schemes in India, in addition to the design of a new scheme that cannot be countered by its trading partners. Moreover, there could be a study at a multi-disciplinary level to assess the role of Track II diplomacy in the bilateral partnership, beyond merely the economic dialogue. Further, the role of Governmental initiatives such as 'Make in India' in spurring the entrepreneurial enthusiasm and in fostering international trade can be taken up at greater depth. In other words, the fact that this trade dispute is a harbinger for deeper commitment in the economic milieu, as a trade war is not beneficial to any country.

References:

1. Asmelash, H. B. (2015). "Energy subsidies and WTO dispute settlement: Why only renewable energy subsidies are challenged", *Journal of International Economic Law*, 18 (2), 261-285.

2. Bansal, V. and Deshpande C. (2017). “The India-Solar cells dispute: Renewable energy subsidies under world trade law and the need for environmental exceptions”, *NUJS L. Rev*, 10, 209. HeinOnline.
3. Bazilian M., Cuming, V. and Kenyon, T. (2020). “Local – content rules for renewables projects don’t always work”, *Energy Strategy Reviews*, 32, 1-10.
4. Behuria, P. (2020). “The politics of late late development in renewable energy sectors: Dependency and contradictory tensions in India’s National Solar Mission”, *World Development*, 126.
5. Chawla K., (2018). “Drivers, Apparatus, and Implications of India’s Renewable Energy Ambitions”. In Scholten D., ed. *The Geopolitics of Renewables. Lecture Notes in Energy*, 61, Springer, Cham, 203-227.
6. Chaudhury, A., Krishna, C. and Sagar A. (2015). “Policy making for renewable energy in India: Lessons from wind and solar power sectors”, *Climate Policy*, 15 (1), 58-87.
7. De Graaf, T. V. and Asselt, H. V. (2017). “Introduction to the special issue: Energy subsidies at the intersection of climate, energy and trade governance”, *International Environmental Agreements*, 17, 313-326.
8. Duran, G. M. (2018). “Sheltering government support to ‘green’ electricity: The European Union and the World Trade Organization”, *International and Comparative Law Quarterly*, 67 (1), 129-165.
9. Fang, M. M. (2019). “Shades of green: Mapping the parameters of the GATT Article III: 8 (a) Government procurement derogation in the renewable energy transition”, *The Journal of World Investment and Trade*, 20 (4), 553-576.
10. Ferris, J. (2015). “Fueled by free trade: WTO trade agreements ensuring the proliferation of solar technology”, *Environmental Law and Policy Review*, 39 (3), 788-826.
11. Ghorl, U. (2018). “Reverse permissibility” in the Renewable energy sector: Going beyond the US-India solar cells dispute”, *Asian Journal of International Law*, 8 (2), 322-349.
12. Ghosh, S. (2020). “Litigating climate claims in India”, *American Journal of International Law Unbound*, 114, 45-50.
13. Hajdukiewicz, A. and Pera, B. (2020). “International trade disputes over renewable energy – the case of Solar Photovoltaic sector”, *Energies*, 13 (2), 500.

14. Helble, M. and Shepherd, B., (2017). *Win-win. How international trade can help meet the Sustainable Development Goals*, Tokyo: Asian Development Bank Institute, 297-301.
15. Hoekman, B. M. and Kostecki, M. M., (2001). *The political economy of the world trading system-The WTO and beyond*, New York: Oxford University Press, 441-448.
16. IMF, OECD, World Bank and WTO (2022). “Subsidies, trade and international cooperation”, 1-47.
17. IRENA (2019). “Future of Solar photovoltaic: Deployment, investment, technology, grid integration and socio-economic aspects (A Global Energy Transformation paper)”, International Renewable Energy Agency (IRENA), Abu Dhabi.
18. Issac and Menon (2017). “When good intentions are not enough: Revisiting the US-India solar panels WTO dispute”, *OIDA International Journal of Sustainable Development*, 10 (2), 38-44.
19. Karttunen, M. and Moore, M. O. (2018). “India-Solar cells: Trade rules, climate policy and Sustainable Development Goals”, *World Trade Review*, April issue, 17 (2), 215-237.
20. Lewis, J. I. (2014). “The rise of renewable energy protectionism: Emerging trade conflicts and implications for low carbon development”, *Global Environmental Politics*, 14 (4), 10-35.
21. Mathews, J. A. (2016). “Global trade and promotion of cleantech industry: a post-Paris agenda”, *Climate Policy*, 17 (1), 102-110.
22. Rubini, L. (2014). “The good, the bad and the ugly. Lessons on Methodology in legal analysis from the recent WTO litigation on renewable energy subsidies”, *Journal of World Trade*, 5, 895-938.
23. Shadikhodjaev, S. (2017). “India-Certain measures relating to Solar cells and solar modules”, *American Journal of International Law*, 111 (1), 139-147.
24. Sharma, N., Tiwari, P. and Sood, Y. (2012). “Solar energy in India: Strategies, policies, perspectives and future potential”, *Renewable and Sustainable Energy Reviews*, 16 (1), 933-941.

Web References:

25. <https://www.cambridge.org/core/journals/world-trade-review/article/indiasolar-cells-trade-rules-climate-policy-and-sustainable-development-goals/634FA8DE11A39FD9E847C15029577C32>

26. <https://cleartax.in/s/gst-rates-solar-power-based-devices-systems>
27. <https://economictimes.indiatimes.com/news/economy/foreign-trade/india-trying-to-resolve-trade-disputes-with-many-nations-suresh-prabhu/articleshow/64697310.cms>
28. <https://economictimes.indiatimes.com/news/economy/foreign-trade/solar-case-against-us-india-appeals-against-certain-parts-of-rulings-by-wto-dispute-panel/articleshow/70793197.cms>
29. <https://economictimes.indiatimes.com/news/economy/foreign-trade/us-india-agree-to-end-six-wto-disputes-lift-some-tariffs/articleshow/101200514.cms>
30. <https://economictimes.indiatimes.com/news/economy/foreign-trade/india-us-mutually-resolve-all-six-trade-disputes-at-wto-official/articleshow/101835832.cms?from=mdr>
31. https://www.economist.com/asia/2023/02/23/indias-solar-power-rollout-is-flagging?gclid=EAIaIQobChMI8OG_i9ve_wIV1a2WCh0NpgF8EAAYASAAEgKN2vD_BwE&gclsrc=aw.ds
32. <https://www.energy.gov/eere/analysis/energy-intensity-indicators-methodology-caveats-and-cautions>
33. <https://www.financialexpress.com/opinion/india-us-trade-dispute-why-strong-response-and-engagement-is-needed/1103221/>
34. <https://www.icmrindia.org/casestudies/catalogue/Law/LAW005.html>
35. <https://www.livemint.com/Politics/UNRFSuIcJ4KYvUBWfu59wL/WTO-IndiaUS-dispute-over-solar-cells-modules-intensifies.html>
36. <https://www.livemint.com/news/india/india-wins-solar-case-against-us-at-wto-1561634893762.html>
37. <https://www.nrdc.org/sites/default/files/india-concentrated-solar-power.pdf>
38. <https://ornatesolar.com/blog/the-top-5-solar-countries-in-the-world#:~:text=China's%20solar%20prowess%20is%20staggering,GW%20of%20Solar%20PV%20systems.>
39. <https://www.reuters.com/article/us-usa-trade-india-wto-idUSKCN1TS2B0>
40. <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>
41. <https://www.thehindubusinessline.com/news/world/us-blocks-indias-request-for-wto-compliance-panel-on-solar-dispute/article22708002.ece>

42. <https://www.tpci.in/indiabusinesstrade/blogs/india-us-solar-dispute-what-did-india-actually-win/#:~:text=However%20in%202013%2C%20the%20US,its%20mandatory%20domestic%20content%20requirement.>
 43. www.trademap.org
 44. <https://unctad.org/topic/trade-analysis/trade-and-SDGs>
 45. <https://unric.org/en/sdg-7/>
 46. <https://unstats.un.org/sdgs/indicators/indicators-list/>
 47. <https://www.un.org/development/desa/disabilities/envision2030.html>
 48. <https://www.wto.org/>
-