ASEAN *Ideas in Progress* Series

7/2021

June 2021

"Role of Renewables and Legal Framework in Conceptualizing Energy Cooperation in ASEAN Region"

Pooja Sharma

Daulat Ram College, University of Delhi

Role of Renewables and Legal Framework in Conceptualizing Energy Cooperation in ASEAN Region

Pooja Sharma[1]

Abstract

Energy is a crucial component of the ASEAN Economic Community (AEC) vision, which strives for an integrated, competitive and resilient region, opening investment opportunities. All the developing economies within the Asia-Pacific region are expected to account for approximately two-thirds of global energy demand growth by 2040 (International Energy Agency, IEA). The countries in this region are energy dependent and rely substantially on energy imports, primarily on oil and natural gas, mainly conventional energy. A substantial production and consumption of energy in ASEAN is based on conventional energy sources. Moreover, renewable energy consumption in the region has been declining over the years. This paper attempts to explore two main objectives. Firstly, the paper examines the renewable energy potential of the region and the level of energy security related to renewable energy. This objective is achieved by computing energy security index for renewable energy, deploying 4A energy framework and Principal Component Analysis (PCA method). Secondly, the paper attempts to examine the significance of legal and regulatory framework in the energy cooperation of renewable energy. Energy cooperation in the arena of renewable energy would entail a well-structured legal framework that formulates various energy-related Acts, tariffs, custom duties on raw material, technology patents, etc. The paper proposes certain crucial policy recommendations for achieving energy security related to renewable energy, proposing a legal regulatory framework for energy cooperation to strengthen deployment of renewable energy.

Keywords: Renewables, Energy transition, 4A definition of security, Legal framework, ASEAN, Regulatory framework.

[1] Assistant Professor, Department of Economics, Daulat Ram College, University of Delhi, PhD Scholar, Energy Studies Program, School of International Studies, Jawaharlal Nehru University, New Delhi, India.

Introduction

With the onset of the global challenge of climate change, the Association of Southeast Asian Nations (ASEAN) aims to ensure sustainable energy security for all the countries belonging to this region. In this context, ASEAN aims to achieve a 23 percent share of renewable energy in the total primary energy supply by 2025, and is therefore heading towards energy transition. All the developing economies of Asia-Pacific region are expected to account for approximately two-thirds of global energy demand growth by 2040 (International Energy Agency, IEA). The countries in this region are energy dependent and rely substantially on energy imports, primarily on conventional energy sources such as oil and natural gas. Energy is a crucial component of the ASEAN Economic Community (AEC) vision, which entails an integrated, competitive and resilient region, opening investment opportunities.

Energy security implies an uninterrupted, reliable supply of energy at affordable prices. Metcalf (2013) defined energy security as the ability of households, businesses and government to accommodate disruptions in supply in energy markets. Energy security is also addressed as the "availability of sufficient supplies at affordable prices" (Yergin, 2006). On the other hand, Sovacool and Mukherjee (2011) proposed that "energy security should be comprised of five dimensions related to availability, affordability, technology development, sustainability and regulation". Brown and Sovacool (2010) defined energy security as "adequate energy supply and affordable prices as well as social and cultural sustainability and environmental preservation". The European Commission defined energy security as the "uninterrupted physical availability of energy products on the market at an affordable price for all consumers", (Cherp et al., 2012), while the International Atomic Energy Agency (IEA) redefined energy security as "adequate, affordable and reliable access to energy fuels and services, it includes availability of resources, decreasing dependence on imports, decreasing pressures on the environment, competition and market efficiency, reliance on indigenous resources that are environmentally clean and energy services that are affordable and equitably shared".

The present era is characterised by climate change. This brings us to the discourse on development and environment, and the need to adapt a sustainable development path so as to strike a balance between the two. Developed and developing countries alike are working towards adopting policies centred around making their economies resilient to climate change, and at the same time, adopting sustainable development strategies. With the signing of the Paris Agreement within the United Nations Framework Convention on Climate Change (UNFCCC),

which was signed by 196 parties on 12 December 2015, participating countries have committed to reduce their emissions by specifying their emission targets. Most ASEAN countries have signed the Paris Agreement and are heading towards attaining their specified targets of emission reduction. This emphasizes the need for demand- and-supply-side management of energy sources, focusing on energy sufficiency and shifting towards alternate, clean energy sources that are renewable, such as biomass, solar, wind, etc.

All the countries in ASEAN are characterised by adverse conditions in terms of socio-economic order and face multitude challenges such as inflation, poverty, inequality, lack of adequate capital and infrastructure. Moreover, ASEAN countries are characterized by inadequate access to electricity in remote and rural areas. They are also trapped under the vicious cycle political economy when it comes to availability of energy infrastructure and issue of accessibility. With the signing of the Paris Agreement, ASEAN countries need to undergo energy transition towards renewable energy sources, which in turn, will indirectly require technological enhancement and innovation. Technological innovation is directly dependent on availability of finance and adequate research and development potential, which is substantially deficit in the countries in ASEAN region.

Renewable energy technologies are playing an increasingly greater role in the global economy following the need to ensure energy security as a consequence of greater concerns of climate change. Renewable energy sources such as wind and solar power have immense potential, not only as drivers for local industries, but also to play greater roles in investment and job creation. According to Bloomberg, global investment in renewable energy reached US$310 billion and further accounts for 10.5 million jobs. Having realized the scope and potential of renewable energy market, a synthesis of regional energy cooperation in terms of renewable energy sources will guarantee a win-win situation for all the countries in the ASEAN region.

ASEAN aims to achieve a 23 percent share of renewable energy in its total primary energy supply in the region by 2025, and is therefore heading towards energy transition. All the developing economies of Asia-Pacific region are expected to account for approximately two-thirds of global energy demand growth by 2040 (International Energy Agency, IEA). The countries in this region are energy dependent and rely substantially on energy imports, primarily on conventional energy sources such as oil and natural gas. Energy is a crucial component of the ASEAN Economic Community (AEC) vision, which entails an integrated, competitive and resilient region, and opening investment opportunities. It is anticipated that

ASEAN will experience an increase in energy demand of about 50% by 2025. There is also an aim to increase the share of renewable energy sources to 23% (Smart energy).[2]

Mutual cooperation in the sharing of energy resources and enhanced regional energy transfer through economies of scale would affect the regional power market, availability of energy supply and energy trade infrastructure along with harmonized legal and regulatory frameworks. As envisioned by Ken O'Flaherty, the Regional Ambassador for Asia-Pacific and ASEAN at the United Kingdom Climate Change Conference of the Parties (COP) 26: "[t]ogether we can ensure that every country across Southeast Asia has the ability to unlock their renewable energy potential and pursue clean alternatives to coal power".

In the realm of renewable energy, adequate commercial incentives are required as these projects are driven by private investments. High capital costs along with low plant load factors limit renewable energy projects and make electricity more expensive. The energy transition towards renewable energy sources is primarily guided by technology, finance and market opportunities. Energy cooperation in the arena of renewable energy would require a well-structured legal framework that formulates various energy Acts, tariffs, custom duties on raw material, technology patents, etc. Such a legal framework will ensure an uninterrupted, free flow of not only the inputs and technical know-how related to renewable energy but also the funding for the integrated region. Energy cooperation related to renewable energy requires an institutionalized legal and regulatory authority that governs the exchange of research and development, finances, energy trade and legal issues.

This paper attempts to explore two main objectives. Firstly, the paper examines the renewable energy potential of the region and the level of energy security related to conventional energy. Secondly, the paper attempts to examine the significance of legal and regulatory framework for energy cooperation of renewable energy. The paper is organized under various sections. Section 2 presents the energy security framework for renewable energy, describing the Renewable energy security index. Section 3 provides the methodology. Section 4 discusses the results from research. Section 5 presents the prevailing Climate change and energy cooperation in ASEAN. The regulatory framework for energy systems has been discussed in Section 6.

Some of the case studies of legal conflicts and disputes are presented in Section 6. Section 7 describes the Nordic energy system that serves as a learning experience in the sphere of

[2] https://www.smart-energy.com/industry-sectors/policy-regulation/challenges-to-asean-energy-cooperation/

regional energy integration. The legal conflicts and disputes related to renewable energy technologies have been presented through case studies in Section 8. Section 9 concludes the findings and presents some of the policy recommendations imperative for energy cooperation in ASEAN region.

2. Renewable Energy Security Index: An Augmented Framework for Energy Security

In the backdrop of global challenge of climate change, the notion of energy security has expanded to incorporate environmental and sustainability concerns. Conventional energy technologies fail to address the newly emerged concept of energy security.

Broadly speaking, there are four dimensions of energy security: availability, accessibility, affordability and acceptability. To date, renewable energy technology is the most plausible energy technology to pass all four aspects of energy security. As a result, energy security becomes one of the most critical factors determining the role of renewables in the energy transition. The 4A energy security framework was introduced by the Asia-Pacific Energy Research Centre (APERC) 2007.

The four broad aspects of energy security have been captured by selected indicators in the schematic representation in Figure 1:

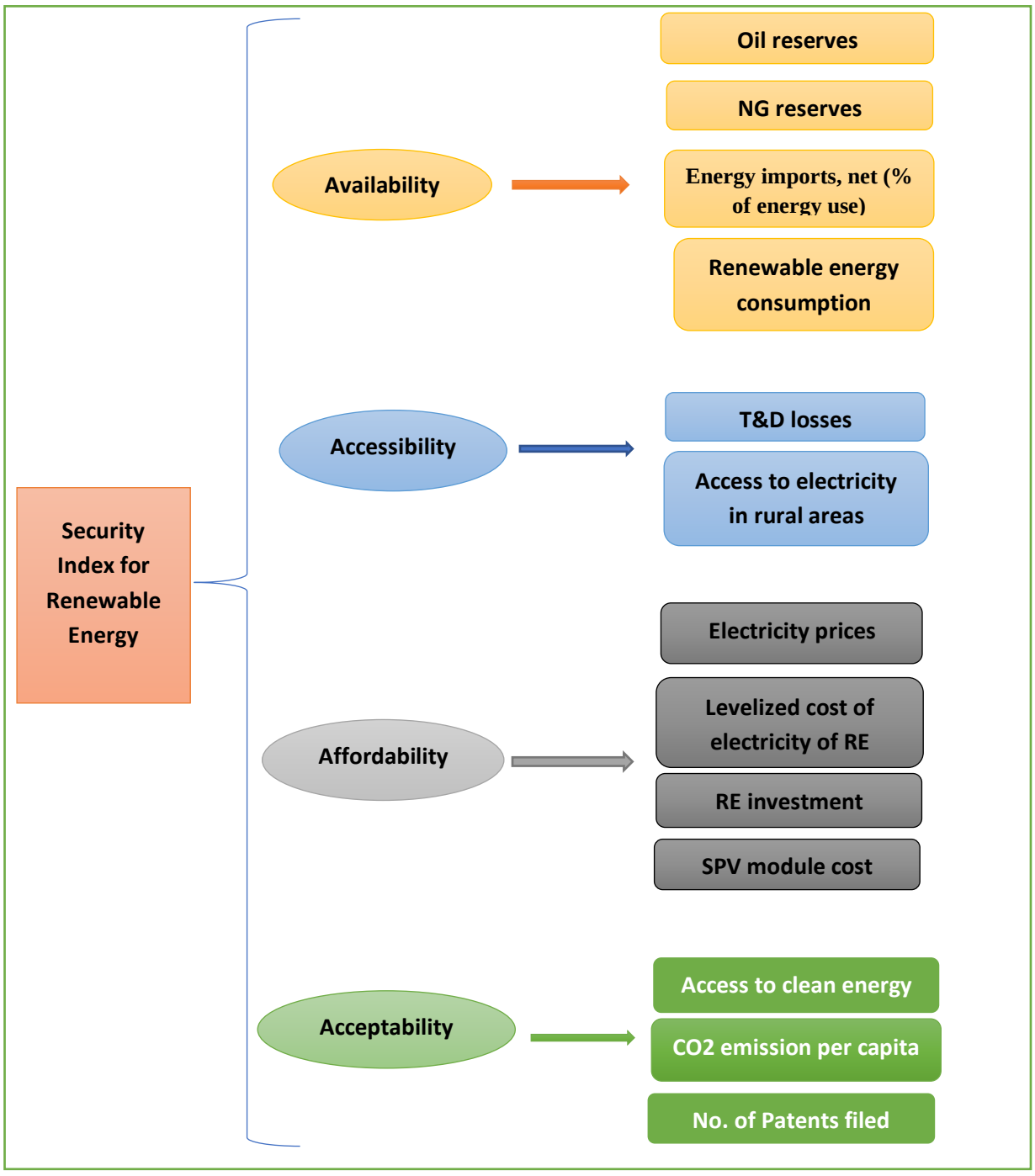


Figure 1: A schematic representation of the four broad aspects of energy security for renewable energy.

2.1 Availability

The availability of renewable energy can be defined in the context of availability of primary energy alternatives. This is because as conventional energy availability, such as oil and natural gas reserves, plays a critical role in ensuring renewable energy. Net energy imports also contribute to the availability of energy for various economic activities. Further, renewable energy consumption as percentage of total consumption provides a substantial role of renewables in meeting the demand for energy in the region.

2.2 Accessibility

In the ASEAN region, the issue of accessibility in remote and rural areas is the biggest challenge and concern in achieving energy security. Transmission and distribution losses along with the indicator of accessibility of electricity in rural areas reveals the status of accessibility in the region or a country. This indicator serves to identify gaps in achieving the accessibility where renewable energy can play a critical role.

2.3 Affordability

Affordability of an energy source is crucial for its large-scale adaptation. Electricity prices constitute a significant part of affordability. The total resources spent on renewable energy investment indicates the cost incurred in deploying renewable energy. Further, the levelized cost of renewable energy along with solar photovoltaic (PV) module costs are some of the factors that directly influence the affordability of renewable energy.

2.4 Acceptability

Acceptability is a crucial component of energy security that guarantees sustainable clean energy with social acceptance. To capture this aspect of energy security, access to clean energy fuel is a significant variable. Moreover, carbon dioxide emissions per capita serves as a significant indicator for acceptability. The number of patents filed in terms of clean energy

technologies indicates the involvement and keenness in energy transition of a country or a region's energy regime.

3. Methodology

The main objective behind the PCA methodology is to reduce dimensionality associated with data and convert interdependent coordinates to independent ones. A PCA based energy security index has been constructed using SPSS (Version 22) statistical software. Eigenvalues of each variable are identified, explaining the maximum variation within the data. Using the selected Eigenvalues, components corresponding to the selected Eigenvalues are extracted from the Rotational Matrix. The product of each selected Eigenvalue with its corresponding component is attained and summed up for each variable. The value of each variable is then multiplied with the corresponding weight. "A sum of all the cross products is obtained and divided with the total of all the weights to achieve one composite index" (Shlens, 2003). Considering the ten countries in the ASEAN region, a security index is computed in context of renewable energy. This security index comprises of all four aspects of energy security mainly, availability, accessibility, affordability and acceptability. The description of the variables and indicators have been compiled in Table 1:

Table 1: Description of Indicators selected for Renewable Energy Security Index Construction

S/no.	Dimension		Indicator	Unit	Source
1.	Availability	Self-sufficiency in conventional energy	Net energy imports (Energy imports % of TPES)	Proportion	IEA
			Oil reserves	Proportion	BP Statistics
			Natural gas reserves	Proportion	BP Statistics
		Proportion of renewables	% of RE in electricity generation	Proportion	IEA
2.	Accessibility	Social equity	Access to electricity in rural areas		World Bank data source
		Transmission and distribution	Losses		IEA

3.	Affordability	Economic factors	Average prices of primary fuel		
			Average rates of electricity supply utility		India-stat
			LCOE of RE		IRENA
			RE investment		
			SPV module cost		
4.	Acceptability	Environment	CO2 emissions per capita		
			No, of patents filed		
			Access to clean energy		

4. Results and Discussions

The paper provides an overview for the potential market for renewable energy sources in the ten ASEAN countries and their regional or national commitment and targets for carbon free growth. From the prism of energy dependency or availability aspect of energy security, the countries in ASEAN region are both energy-exporting and energy-importing. When energy use exceeds the energy production, the country is an energy net importer. Countries such as Cambodia, Thailand, Philippines, and Singapore are net importers of energy, while countries such as Brunei, Indonesia, Laos, Malaysia, Myanmar and Vietnam are net exporters. The country-specific Energy Efficiency and Renewable energy targets in ASEAN region have been compiled in the Table 2:

Table 2: Renewable Energy Targets for Countries in the ASEAN Region

S/no.	Countries in ASEAN region	Renewable Energy (RE) Targets	Energy Efficiency (EE) Targets
1	Brunei	To attain 10% RE in power generation, 954 GWh by 2035	To reduce energy intensity by 25% by 2030 and 45% by 2035. 63% of energy saving by 2035
2	Cambodia	To establish large hydro of 2,241 MW by 2020	To reduce energy consumption by 20% in 2035

			Rural electrification to 80%and 27% emission reduction by 2030
3	Indonesia	Around 23% RE share by 2025 and 31% RE share in 2030.	To achieve 1% energy intensity reduction and to reduce energy consumption in 2025 by 17%
4	Laos	To attain 30% RE share in total energy consumption by 2025. Achieve 10% biofuel use in transportation sector by 2025	Reduce TFEC by 10% in 2030
5	Malaysia	To attain RE installed capacity of 2080 MW by 2020	To reduce electricity consumption by 8% in 2025 35-35% emission intensity reduction in 2030.
6	Myanmar	To attain 38% hydro, 20% natural gas and 33% coal and 9% of renewable sources in energy mix.	To reduce electricity consumption by 20% in 2030
7	Philippines	Around 15.2 GW installation of RE and additional wind capacity of 2,345 MW in 2022, additional hydro of 5,398 MW in 2030.	To reduce TFEC by 1% per year by 2040, reducing 33% energy demand. To reduce Energy intensity by 40% by 2040 To reduce carbon emissions by 20% by 2020.
8	Singapore	Around 350 MWp of solar power installation by 2020 and additional capacity for waste to plant	To reduce energy intensity by 20% by 2020, and 35% by 2030.
9	Thailand	To achieve 30% renewable in total energy consumption by 2036	To reduce energy intensity by 30% in 2036 and reduction of GHG by 20%

10	Viet Nam	To attain 21 % of RE in 2020, 13% RE in 2025 and 21% of RE in 2030.	To reduce TFEC by 8% in 2020 and reduce energy intensity by 10% by 2020

TFEC: Total Factor Energy Consumption

Data source: IEA[3]

4.1 Energy mix in ASEAN region

The energy mix in production and imports have been reflected in Figure 2 to Figure 8. Approximately 30% of the total energy mix in production in 2000 is contributed by natural gas in the ASEAN region, while only 4% was contributed by renewable sources such as wind and solar energy. See Figure 2:

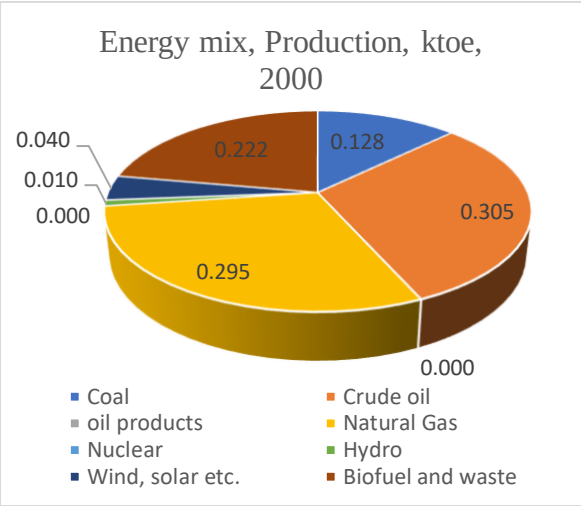


Figure 2: Energy mix, ASEAN region 2000

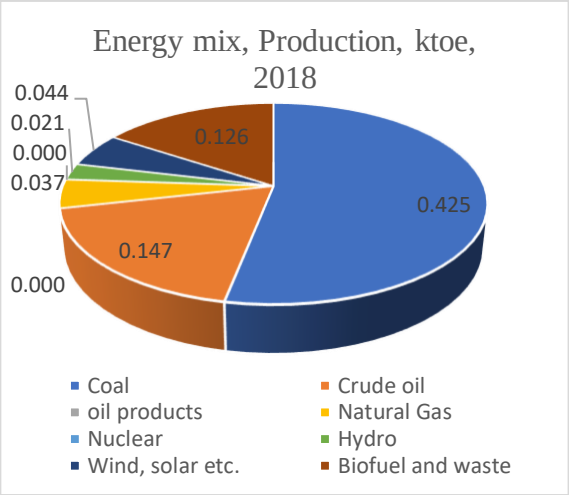


Figure 3: Energy mix, production, ASEAN region 2018

However, in 2018, the energy mix composition in ASEAN region has substantial contribution from coal. This reflects the issue of concern with respect to energy transition to more renewable and clean energy regime as the energy regime has shifted towards coal as opposed to the renewable energy targets specified by ASEAN countries.

[3] International Energy Agency (IEA). 2017. Southeast Asia Energy Outlook 2017. Paris: OECD/IEA.

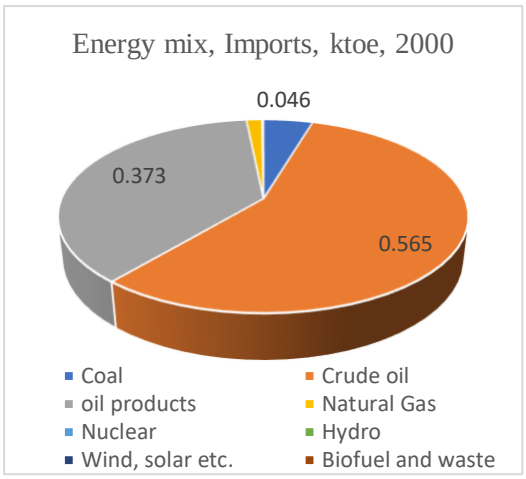


Figure 4: Energy Imports, ASEAN region 2000

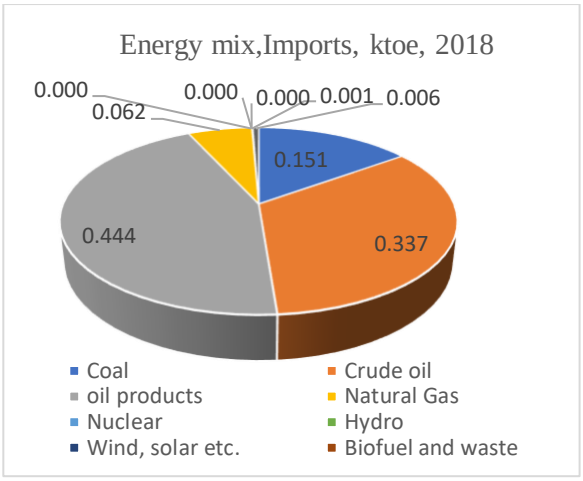


Figure 5: Energy Imports, ASEAN region 2018

The ASEAN region imported more proportion of crude oil and oil products and there is observed no significant variation between 2000 and 2018 as depicted in Figure 4 and Figure 5.

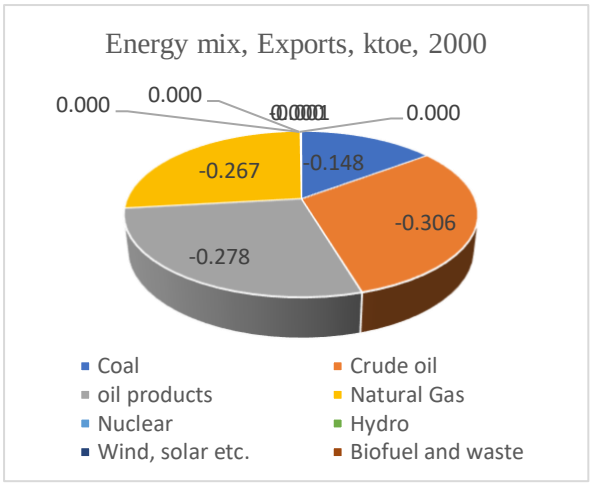


Figure 6: Energy Exports, ASEAN region 2000

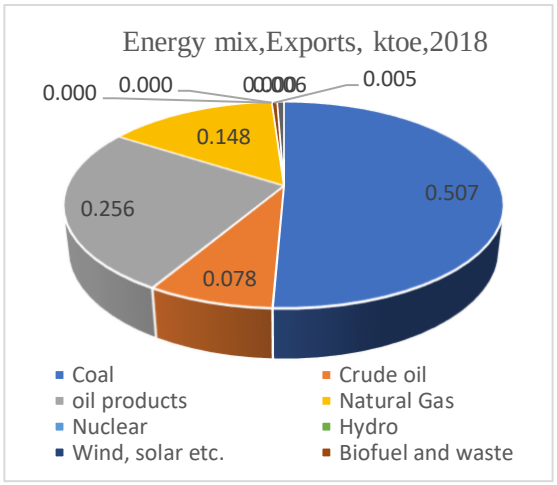


Figure 7: Energy Exports, ASEAN region 2018

The ASEAN region is exporter of coal and the proportion increased substantially in 2018 as compared to 2000, as depicted in Figure 6 and Figure 7.

The trends in energy mix related to production and export/import situation indicate that there is an urgent need to reduce the proportion of primary energy in the production and consumption systems in the ASEAN region.

The proportion of renewable energy in total final consumption has been declining consistently since 2000, as depicted in Figure 8:

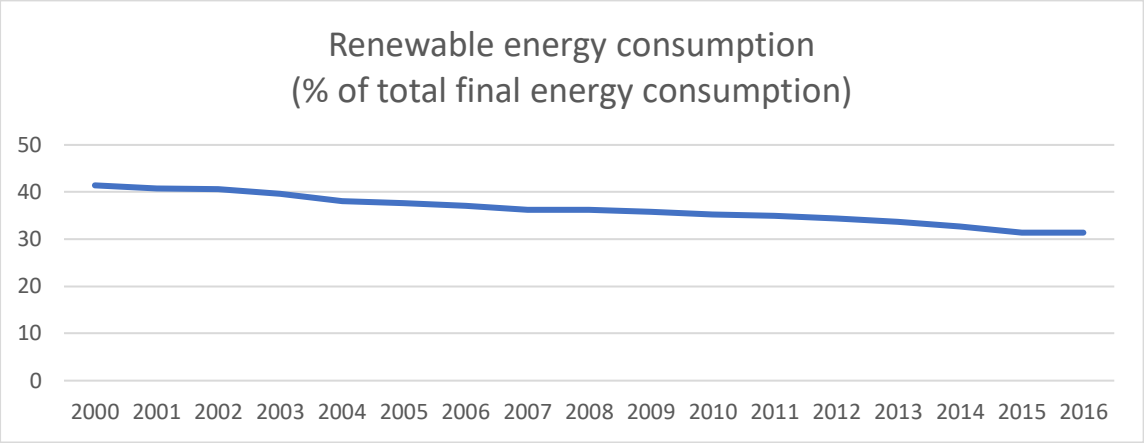


Figure 8: Pattern of renewable energy consumption in the ASEAN region, World Bank

4.2 Energy Security Index for Renewable energy

The energy security index computed for renewable energy for the region of ASEAN region by deploying the PCA method is depicted in the Figure 9:

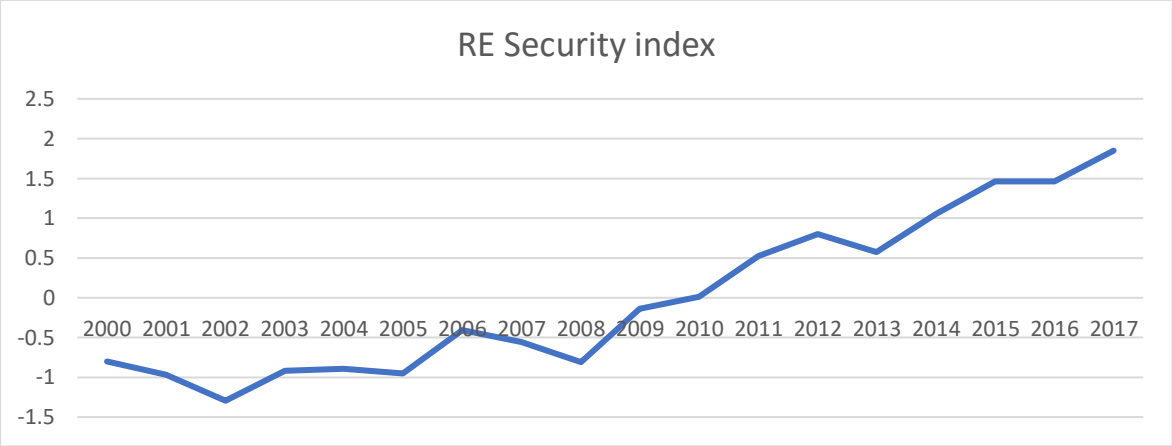


Figure 9: Renewable energy security index for the ASEAN region

In the initial years from 2000 to 2009, the security index has negative values, suggesting that the ASEAN region has been energy insecure. However, energy security has started improving gradually after 2009 and has shown consistent improvement after 2009.

Table 3: Results of Correlation between the components

Correlation Matrix

		Accessibility	Acceptability	Affordability	Availability	RE Security Index
Correlation	Accessibility	1.000	.606	.732	-.484	
	Acceptability	.606	1.000	.796	-.534	
	Affordability	.732	.796	1.000	-.805	
	Availability	-.484	-.534	-.805	1.000	
	RE Security Index	0.813	0.852	0.968	-0.816	1

The values of correlation depict that the security index for renewable energy has a significant positive correlation with accessibility, affordability and acceptability. As energy security for renewable energy improves, access to electricity in rural areas also improves. Similarly, as the affordability indicators such as levelized cost of RE, RE investment, and solar PV module costs reduce, the energy security related to renewable energy improves. Further, as carbon emissions reduce, access to clean energy fuel increases, and the number of patents increases, energy security related to renewable energy improves.

However, the index shows a negative correlation when it comes to availability. The availability component comprises of larger proportion of the reserves of conventional energy increases and net energy imports and also the proportion of renewable energy. It is observed that reserves of conventional energy along with reduced quantities of energy imports guarantee cannot ensure energy security for renewable energy. Moreover, Figure 8 shows a consistent decline in renewable energy consumption. Consequently, the renewable energy security index gradually witnesses an upward movement as observed in Figure 9. This is mainly due to improvement in availability, accessibility and acceptability, which reflect a high positive correlation with the energy security index for renewable energy in Table 3.

5. Climate Change and Energy Cooperation in ASEAN

ASEAN's commitments towards climate change date back to the early 1990s when the UNFCCC was formulated and ratified. ASEAN is fully committed to the Paris Agreement's objectives, and plays a leadership role in addressing climate change issues. ASEAN member states are parties to the UNFCCC and Paris Agreement (ASEAN, 5th September 2020).[4] The member states have proactively taken measures to address issues at national and regional levels. Although the commitment to greenhouse gas reduction targets are voluntary for less developed countries such as Cambodia, setting up targets demonstrates the ASEAN member states' serious commitment towards addressing climate change issues.

ASEAN's commitment to achieve a 21.9 percent reduction in energy intensity compared to 2005 levels exceeds the 2020 target set by ASEAN Plan of Action for Energy Cooperation 2016−2025.[5] Further, the ASEAN Fuel Economy Roadmap for the Transport Sector 2018−2025 is a significant indicator of ASEAN compliance with climate change commitments.

ASEAN became an official observer-organisation to the Energy Charter Conference on 11 December 2003. The Permanent Court of Arbitration hosted an international event on 20 November 2019, promoting awareness for the Energy Charter Treaty (ECT) in Southeast Asia.[6] Further, with energy being one of the key pillars of AEC's vision of an integrated, competitive and resilient region, the ASEAN Plan of Action for Energy Cooperation 2016−2025 (APAEC) has identified opportunities to shape the region's energy development: Phase I of the Plan (2016−2020) includes increasing multilateral power trading between the members with the aim of making the ASEAN Power Grid a reality.

Considering how ASEAN will likely experience an increase in energy demand of approximately 50% by 2025, the current share of renewable energy in the region primary energy supply is around 15%, (IEA, 2019).

An ASEAN regional energy security framework will only be achieved when the strategy of mutual trust is in place. There are several challenges being pointed out such as inert-regional investment. On one side, this type of investment contributes to enhanced connectivity It also

[4] https://asean.org/storage/2020/10/The-ASEAN-Magazine-Issue-5-September-2020.pdf
[5] https://www.smart-energy.com/industry-sectors/policy-regulation/challenges-to-asean-energy-cooperation/
[6] https://www.smart-energy.com/industry-sectors/policy-regulation/challenges-to-asean-energy-cooperation/

creates a regional power structure where power generation can be imported back into the investing countries.

However, there are challenges related to renewable energy integration. These can be addressed by formulating a well-defined regulatory framework coupled with the legal framework that safeguards the interests of all the parties involved in energy trade. Further, the Nordic Energy System provides a great learning experience for electricity and grid integration related to renewable and clean energy sources.

6. Regulatory Framework for Energy

The ASEAN region will benefit from and integrate with a well-planned electricity grid network. ASEAN can consider implementing an electricity grid network that resembles the Nordic Energy System, strengthening international connectivity. An interconnected power system network across borders ensures an efficient power supply system. There exists a substantial need for licensing operators who deal with electricity production or transmission or distribution (IRENA).[7] The relevant licenses are:

- Service provider license;
- Independent power producer license, and;
- Transmission license.

All the producers dealing with renewable energy are required to obtain operator's license under this regulation.

Independent Power Producers can distribute electricity to registered service providers through a Power Purchasing Agreement (IRENA).[8] The Net Metering Regulation addresses the following aspects:

- The framework or the regime must allow the connectivity first serve basis, subject to operational constraints.
- The capacity of the RE system must be determined based on the feasibility of the interconnection with the grid.

[7] https://www.irena.org/-/media/Files/IRENA/Agency/Events/2015/Sep/17
[8] https://www.irena.org/-/media/Files/IRENA/Agency/Events/2015/Sep/17

- The sanction load of the consumer.
- The Regulatory framework must be strengthened by policies, laws, rules and standards as well as incentive schemes to integrate RE into the Energy sector.
- Power Purchase Agreements and other legal documents are drafted to consider developers and investors in the region.

For successful energy cooperation among the ASEAN member states, a combination of regulatory policies, fiscal incentives and public financing should be implemented homogeneously in all the countries belonging to the region (Liptow, H., & Remler, S., 2012).

Table 4: Regulatory policies, fiscal incentives and public financing for ASEAN region

	Regulatory Policies	Fiscal incentives	Public financing
1	Feed – in – tariff	Capital subsidies, Grants or rebates	Public investment loans or grants
2	Renewable Portfolio standards and Quotas	Investment or production tax credits	Public competitive Bidding
3	Net metering	Reduction in sales, CO2 , VAT or other taxes	
4	Tradable Renewable energy certificates	Energy production payment	

A similar or homogeneous energy regime for renewable energy deployment across all countries of ASEAN region must be formulated and enforced by the Energy Charter. The ASEAN Energy Charter must accomplish the following objectives to constitute a strong foundation for energy cooperation for renewables:

1. Defining the renewable energy targets.
    a. By deploying RE targets considering the policy instruments should be advocated across all countries depending on the strength and weaknesses of the energy source.

2. Advocating a comprehensive strategy and ensuring the appropriate involvement of all the stakeholders in achieving the targets.
3. Constituting a legal and instrumental framework for enforcement and ensuring the compliance.
4. An evaluation and assessment process is extremely necessary for monitoring and ensuring compliance.

In order to strengthen energy cooperation among these nations, the rules of the game must be clearly defined in Energy Charter Treaty, ensuring security of energy supply, further providing investor friendly environment for flow of investment and technologies, building investor confidence as well as security for transit countries.

7. Nordic Energy System: Lessons for Energy Integration

The Nordic Energy System is a breakthrough of its own kind. The five Nordic countries of Denmark, Finland, Iceland, Norway and Sweden have announced ambitious goals to decarbonise their energy systems by 2050 (IEA).[9] The Nordic region has substantial clean energy resources mainly hydropower and wind, therefore a sustainable use of resources can contribute in achieving the EU climate targets. There are several productive ways in which efficient utilisation of renewable potential can contribute to achieving climate change targets. Firstly, clean energy can be exported to displace a more emission-intensive generation (Nordic Energy Research). With the aim of increasing the deployment of wind power in Nordic countries and increasing the number of transmission cables under construction and planning, net Nordic exports were 11 TWh, Norway exporting 15 TWh and Sweden 20 TWh (Nordic Energy Research). Further, dispatchable hydropower in the Nordic region can provide balancing services to help integrate the region in context of renewable energy sources (Nordic Energy Research).[10] The Nordic Energy System is one of the world's most secure, affordable and renewable systems.

The Nordic Energy System involves certain crucial features that become the drivers of the energy cooperation related to renewable energy system:[11]

[9] https://www.nordicenergy
[10] https://www.nordicenergy
[11] https://www.nordicenergy.org/wordpress/wp-content/uploads/2018/06/10-Insights-A4.pdf

1. A regional grid

   The presence of common Nordic spot market ensures efficient trade across subnational region. Such cooperation ensures energy security, keeping the energy systems at lower costs and affordable.

2. Similar but different

   Among the five Nordic countries, there are similarities in the share of renewables, which range from 32 to 73% in 2016. However, their transport industry is still dependent on oil. The existence of diversity in proportion of energy mix is the key driver of integration.

3. Low carbon emissions

   An abundance of low-carbon intensity and electricity in the Nordic region provides a stepping stone to mitigate emissions from the sectors such as transport and industry.

4. Steady policies

   All Nordic countries share same energy and climate objectives, leading to steady and long-term energy policies such as carbon taxation, building codes and renewable support.

5. Decarbonizing island energy systems

   Based on distributed generation and flexibility, creating an innovative market design for energy services, also tapping zero-emission energy systems of wind, hydropower, solar, tidal, etc.

6. Good for climate and economy

   Decoupling economic growth from greenhouse gas emissions is the basic aim of all the countries in the region.

In case of ASEAN energy cooperation for renewable energy, the above factors provide a common rationale for energy cooperation and integration as in the case of Nordic energy system.

8. Legal conflicts and disputes related to Renewable Energy technologies: Case studies

There are several trade conflicts related to renewable energy technologies. Specifically, solar energy has been the subject of disputes at the World Trade Organisation (WTO). The main issues of such disputes are the anti-dumping policies, import tariffs and domestic content requirement. The most prominent countries engaged in the trade of solar panels are the United States and China. It is crucial to comprehend that most of the disputes could not be resolved given the nature of the dispute and the complexity involved. The rising number of disputes related to renewable energy technologies reveals a high degree of divergent interests between global players. The international trade competitiveness is substantially in favour of China (Hajdukiewicz, A., & Pera, B., 2020).

A case study of the US-India Solar Panel WTO Dispute (DS456 : The case of India Solar Cells) revolves around the challenge raised by the US concerning the Jawaharlal Nehru National Solar Mission at the WTO, alleging that India's Power Purchase Agreements with solar power developers mandated the use of Indian manufacturers of solar cells and modules.

The Case filed under DS456: India Solar Cells involves the claims by the United States concerning the domestic content requirements (DCR measures) imposed by India during the initial phase of its National Solar Mission (World Trade Organization, 2018)[12].

'The DCR requirement was related to the solar cells or modules used to generate solar power by the solar power developers selling electricity to the government. These DCR measures are found to be trade – related investment measures covered by paragraph 1 (a) of the list in Annex to the TRIM Agreement. The panel found that DCR measures are not distinguishable in any relevant respect from domestic content requirement under the provision by Appellate Body in Canada – Renewable Energy / Feed-in tariff Program. According to Article III 8 (a) of GATT 1994 , the panel found that DCR measures is not covered by the government procurement derogation in Article III 8 (a) of GATT 1994.

[12]https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds456_e.htm#:~:text=India%20argued%20that%20the%20DCR,local%20short%20supply%E2%80%9D%20within%20the

Finally, it was concluded that electricity purchased by the government is not in a 'competitive relationship' with the solar cells and modules subject to the discrimination under the DCR measures.

India defended by arguing that DCR measures are justified under the general exception in Article XX (j) of GATT 1994 on the ground that its lack of domestic manufacturing capacity in solar cells and modules and the corresponding risk of disruption in imports makes these products fall under the provision. The DCR measures are also justified under Article XX (d) of GATT 1994 on the grounds that they secure India's compliance with 'law or regulation' required to take steps to promote sustainable development.

However, the panel found that most of the instruments identified by India did not constitute "laws or regulation" within the meaning of Article XX (d) or were not laws or regulations in respect of which the DCR measures "secure compliance". Therefore, the panel found that India failed to demonstrate that the challenged measures are justified under the Article XX (d)' (World Trade Organization, 2018)[13].

This was argued to be in violation of India's domestic content requirement and obligations under the WTO. This case mainly represents conflict between protectionists trade policy and international trade obligations. The concern of India to achieve its clean energy targets does not provide sufficient rationale for mandating the local content requirement (Isaac, G., & Menon, T., 2017).

Moreover, it is observed that there are several disputes reported in WTO related to content requirements, subsidies, and tariffs involving the US, India, Canada, Korea, and China. Such disputes reveal the need and competition to promote the use of domestic raw materials and technologies in the field of renewable energy sources. Consequently, any regional, bilateral or multilateral policies must incorporate and safeguard legal rights related to energy trade. The rules of the game must be pre-defined to take into account the justice to the relevant stakeholders involved in the trade.

[13]https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds456_e.htm#:~:text=India%20argued%20that%20the%20DCR,local%20short%20supply%E2%80%9D%20within%20the

9. Conclusion

Against the global challenge of climate change, ASEAN aims to ensure sustainable energy security for all member states. The ASEAN region exhibits a high proportion of conventional energy in production, exports and imports. In the context of energy transition for ASEAN countries, the renewable energy consumption as a percentage of total energy consumption in the region has been declining. The computed renewable energy augmented security index exhibits an improvement in energy security pertaining to renewable energy, driven mainly by improvement in access to electricity in rural areas and increased affordability of renewable energy. Further, as carbon emissions reduce, access to clean energy fuel increases, and the number of patents increase, energy security for renewable energy improves. However, the availability aspect of energy security has declined between 2000 to 2016. This indicates that there is an immense need to enhance renewable energy consumption in the ASEAN region. There is still a substantially high proportion of conventional energy in the production, consumption and net imports. This challenge of energy transition can be unfolded through a regional energy cooperation among the ASEAN member states to tap into the optimal potential of renewable energy.

The challenges related to renewable energy integration can be addressed by formulating a well-defined regulatory framework, coupled with a legal framework that safeguards the interests of all the parties involved in energy trade. Further, the Nordic Energy System is a great example for electricity and grid integration related to renewable and clean energy sources.

It is observed that there are several disputes reported in WTO related to content requirement, subsidies, tariffs involving the US, India, Canada, Korea, and China. Such disputes reveal the need and competition to promote the domestic raw materials and technologies in the field of renewable energy sources. This paper recommends crucial policy reforms in the energy sector so that ASEAN countries can operate at the same level while initiating energy cooperation in the context of renewable energy sources.

References

1. Metcalf, Gilbert E., The Economics of Energy Security (November 2014). Annual Review of Resource Economics, Vol. 6, Issue 1, pp. 155-174, 2014. Available at SSRN: https://ssrn.com/abstract=2507226 or http://dx.doi.org/10.1146/annurev-resource-100913-012333

2. Yergin, D. (2006). Ensuring energy security. *Foreign affairs*, 69-82.

3. Sovacool, B. K., & Mukherjee, I. (2011). Conceptualizing and measuring energy security: A synthesized approach. *Energy*, *36*(8), 5343-5355.

4. Sovacool, B. K., & Brown, M. A. (2010). Competing dimensions of energy security: an international perspective. *Annual Review of Environment and Resources*, *35*, 77-108.

5. Cherp, A., Adenikinju, A., Goldthau, A., Hughes, L., Jansen, J., Jewell, J., ... & Vakulenko, S. (2012). Energy and security.

6. Liptow, H., & Remler, S. (2012). Legal Frameworks For Renewable Energy-Policy Analysis For 15 Developing And Emerging Countries.

7. Hajdukiewicz, A., & Pera, B. (2020). International Trade Disputes over Renewable Energy—the Case of the Solar Photovoltaic Sector. *Energies*, *13*(2), 500.

8. Isaac, G., & Menon, T. (2017). When Good Intentions Are Not Enough: Revisiting the US-India Solar Panels WTO Dispute. *OIDA International Journal of Sustainable Development*, *10*(02), 37-44.

Appendix

Results of PCA method

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Accessibility	.476921495000000	.249656561000000	18
Acceptability	.466356761000000	.138527037000000	18
Afforabilty	.485447950000000	.171571742000000	18
Availability	.397545635000000	.136022691000000	18

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.661
Bartlett's Test of Sphericity	Approx. Chi-Square	44.206
	df	6
	Sig.	.000

Communalities

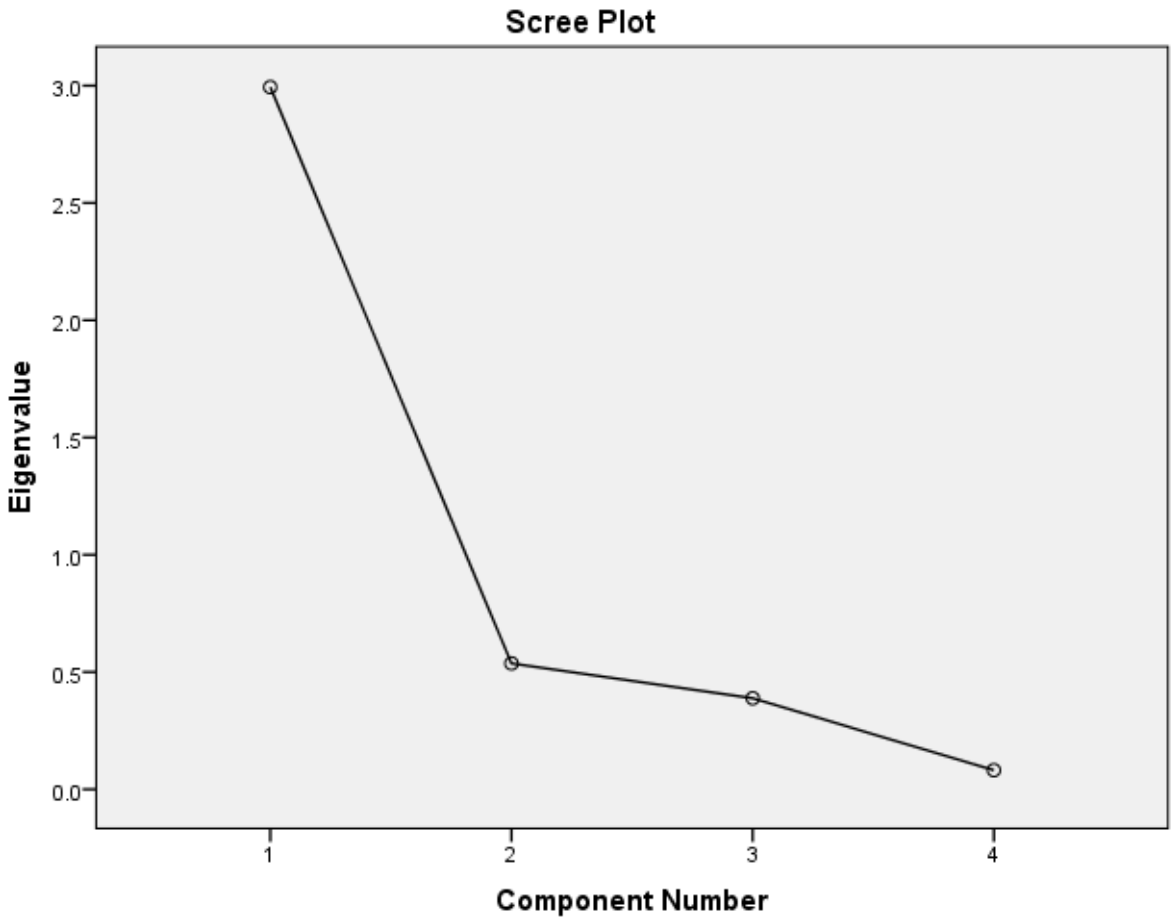
	Initial	Extraction
Accessibility	1.000	.661
Acceptability	1.000	.727
Afforabilty	1.000	.938
Availability	1.000	.667

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.994	74.844	74.844	2.994	74.844	74.844
2	.537	13.416	88.261			
3	.388	9.704	97.964			
4	.081	2.036	100.000			

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component
	1
Accessibility	.813
Acceptability	.853
Afforabilty	.969
Availability	-.817

Extraction Method: Principal Component Analysis.

a. 1 components extracted.