

How to improve **solar energy** contribution in energy mix supplies in **Southeast Asia**?



TEAM 2



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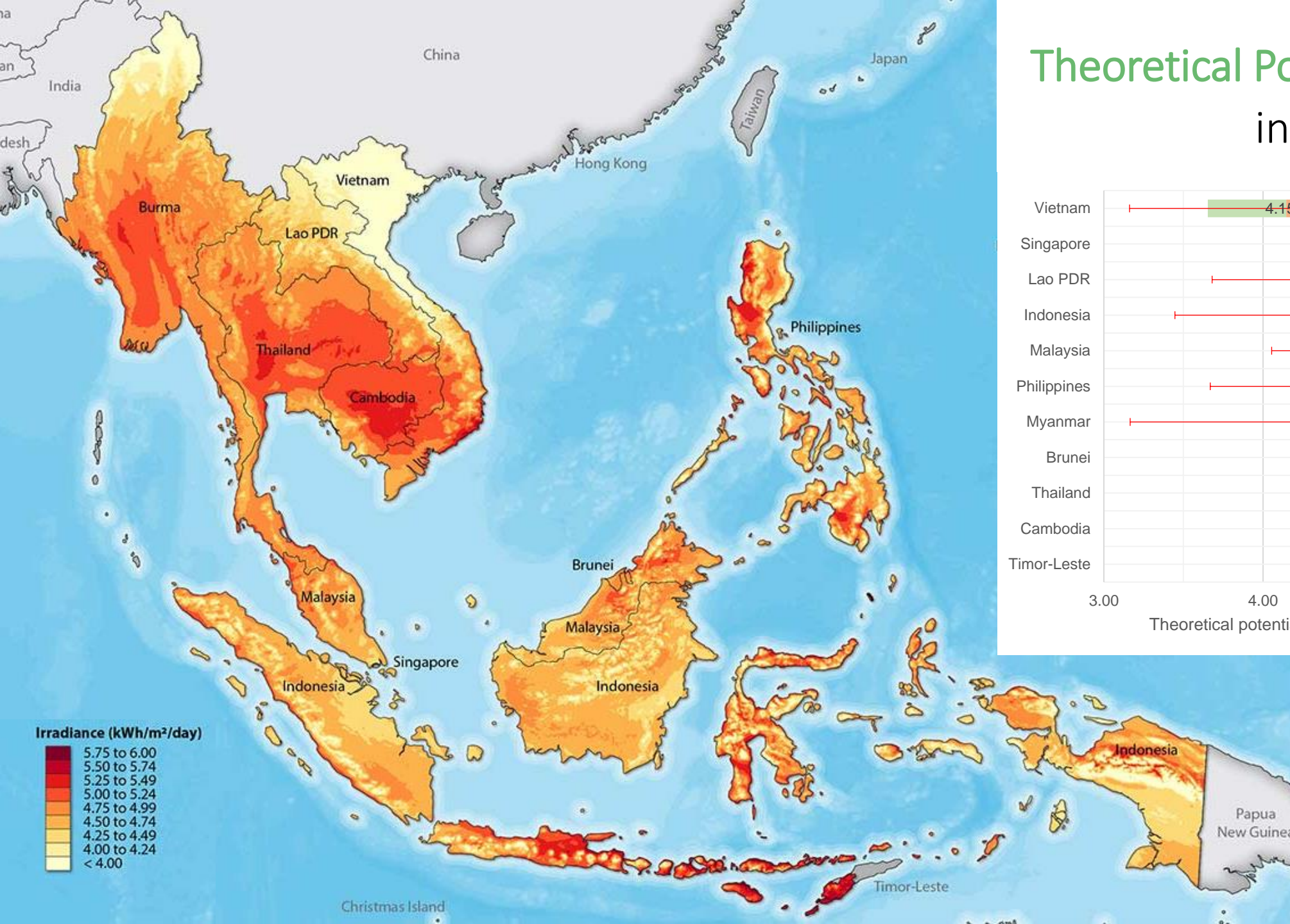
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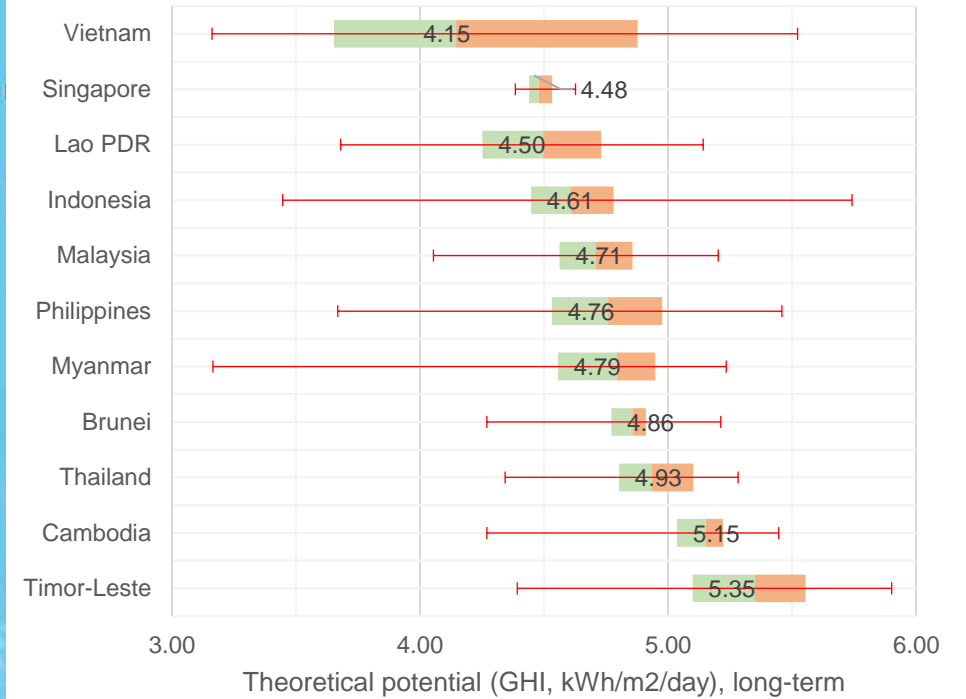
Teeranun Newachuen

Energy Economics and Policy Seminar, July 2021

The largest Solar Power Plant in Southeast Asia
Xuan Thien - EaSup Solar Power Plant (Daklak - Vietnam) 830MWp
December, 2020
Source: Daklak.gov.

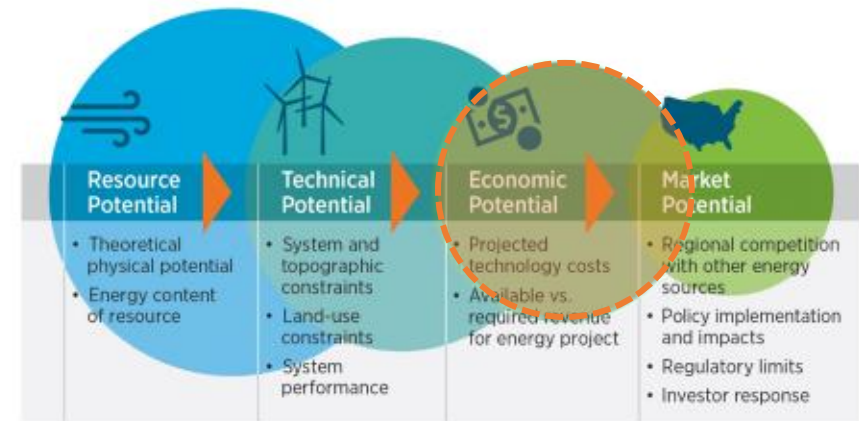
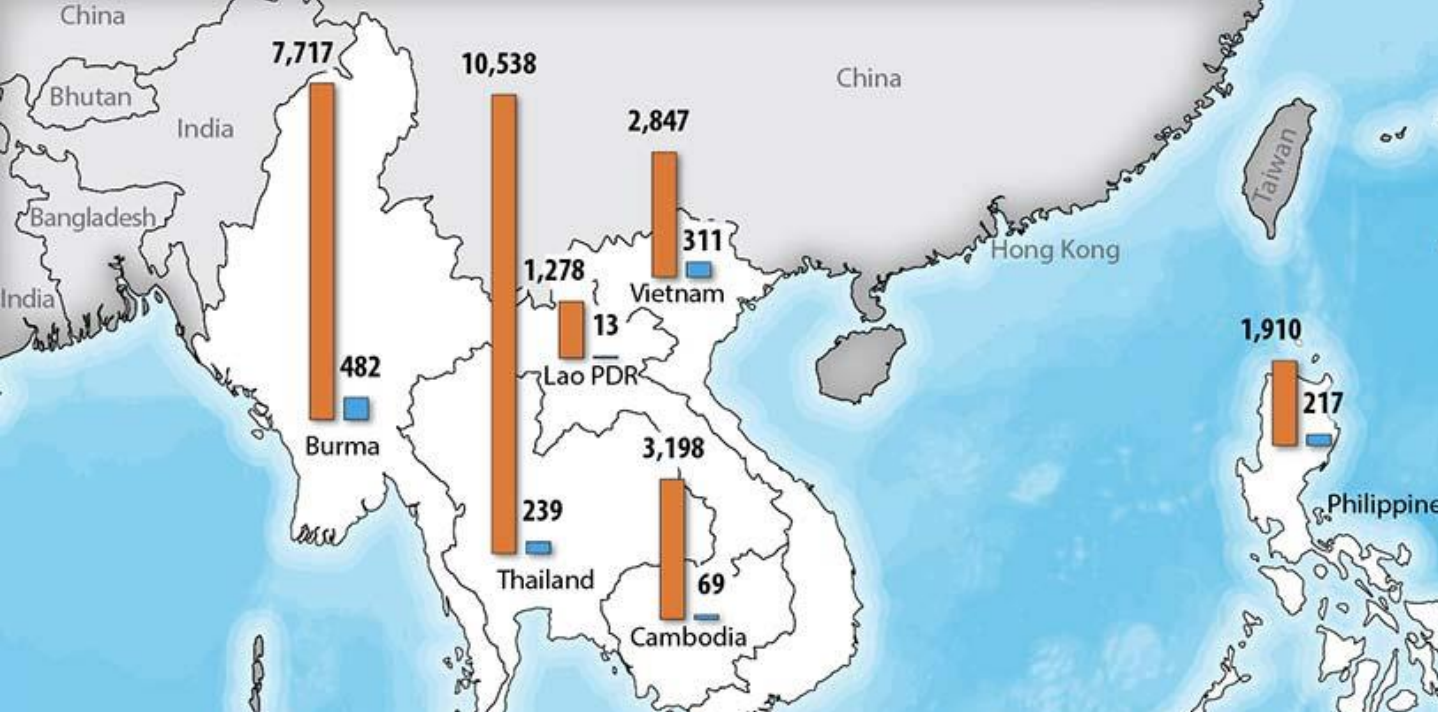


Theoretical Potential of Solar in Southeast Asia



Source:





Source: (Brown et al. 2016)

Economic Potential of Solar in Southeast Asia



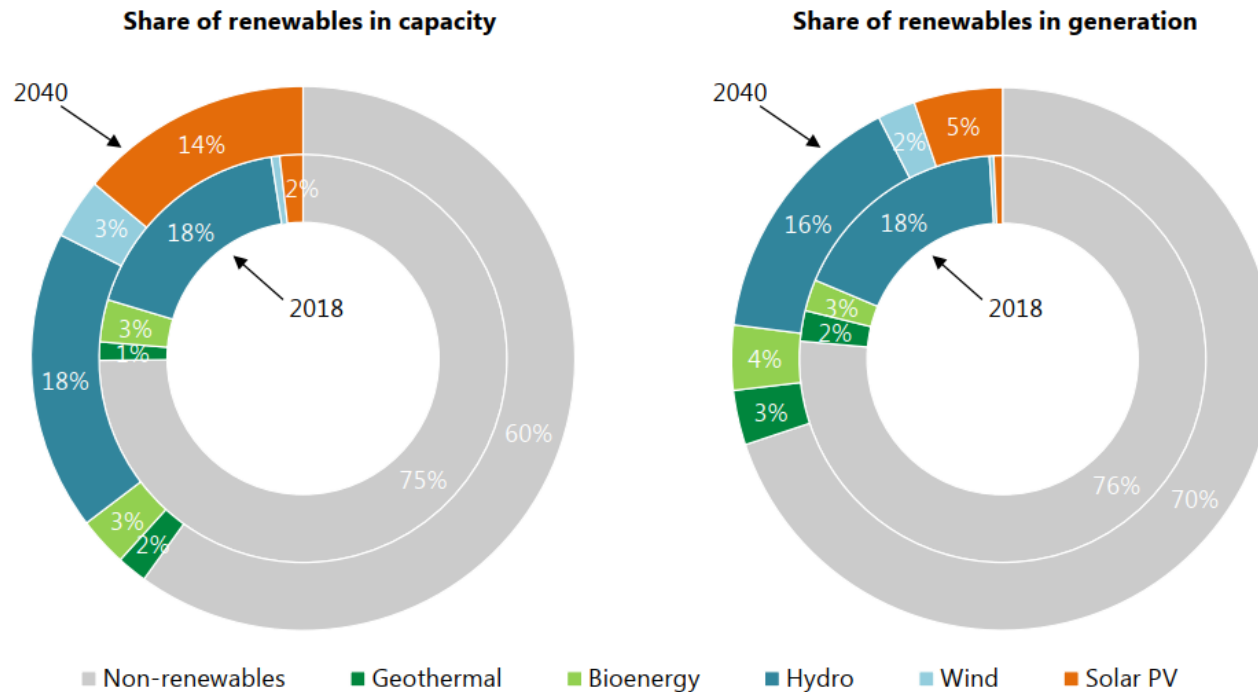
Most of the Southeast Asia countries have great potential to develop solar energy

Source:

Development status

Share of renewables in Southeast Asia in the **Stated Policies Scenario (*)** 2018 and 2040

(*) **Stated Policies Scenario** is a pathway that reflects today's policy frameworks and ambitions

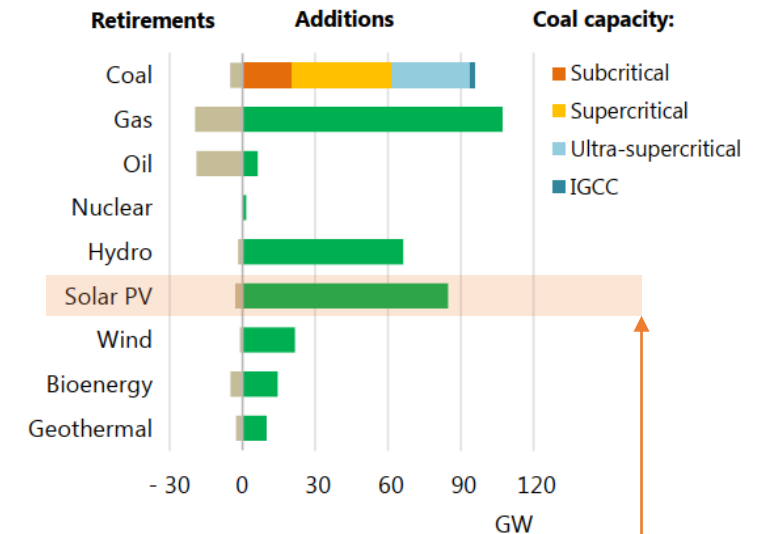


- Current share of **Solar PV** in the Energy mix in **Southeast Asia** is very low and **inconsistent** with the potential

Source: IEA - Southeast Asia Energy Outlook 2019

Change in installed capacity in Southeast Asia in the **Stated Policies Scenario**

Change in installed power capacity by technology, 2019-40



To 2040, with the current policy frameworks and ambitions, nearly **90GW** of Solar PV need to installed in South East Asia

Background & Research question

Background:

- Most of the Southeast Asia countries have great potential to develop solar energy
- Current share of **Solar PV** in the Energy mix in **Southeast Asia** is very low and **inconsistent** with the potential
- To adapt the power demand growth, **Southeast Asia** need more approx. **90GW** of Solar PV in the next 20 years (to 2040)

Research question:

- How to improve solar energy contribution in energy mix supplies in Southeast Asia?

Methodology

Methodology:

- Review the Solar sector in member's countries by divide into 2 Groups:
 - Countries that have **some success in solar sector**: **Thailand, Vietnam**
 - Countries that solar sector in **early stage**: **Indonesia, Phillipinnes, Timor-Leste**
- Compare between each country and group to find the key factors that influence to the development of solar sector

Hypothesis on factors that influence to the development of solar sector:

- Adopt the general framework in Chapter 4 - IRENA, Renewable Energy Market Analysis (2018) with some modify for solar:

National Policy/ Legal

- Solar law/ regulation
- Solar develop target/ strategy
- Solar development program

Fiscal/ Financial incentives

- Pricing/ incentives
- Corporation Income Tax (CIT) exemption
- Solar Support from the financial institutions

Offtaker

- PPA
- Guarantee from offtaker

National/ Local Grid access

- Accessible to the national/ local grid

Technical requirements

- Specific standards/requirements
- Specific EIA requirements
- Local content requirements for equipment

Others

- Land Acquisition
- Restrict on Foreign Investment

Vietnam

Catalogue	Criteria	Vietnam (in long-term)
National policy	Law/ regulation on Solar	- Regulated by the "Incentives for development Solar Energy in Vietnam" - In the list of business line eligible for investment incentives
	Solar develop target/ strategy	- Development Target is regulated in the National Master Plan (PDP7 rev.) - Government approval (case-by-case)
	Solar development program	Follow the Incentives Regulations & PDP7 rev.
Fiscal/ Financial incentives	Pricing/ incentives	High Feed-in-Tariff (FiT): 7.09 - 9.35 USCent/kWh (FiT1) & 7.09 US Cent/ kWh (FiT2)
	Corporation Income Tax (CIT) exemption/ incentives	- Exempted 100% CIT in the first 04 years, 50% CIT in the next 09 years - Apply CIT at 10% within 15 years from COD
	Support from the financial institutions	- International/ Local Financials are willing to support financing for Solar project - Local Banks developed specialize loans/ financial package for Solar project <i>(such as small scale rooftop solar)</i>
Off-taker	PPA	- Standard & long term (20 years and renewable) PPA - The procedure to sign PPA is clear/ transparent, especially with the rooftop solar
	Guarantee from offtaker	- Guarantee from off-taker (EVN) via PPA - Some projects faced with the curtailment risk (National Grid was overloaded).
Grid	Accessible to the national/ local grid	- Can access to the national grid after got approval from Government (MOIT)/ EVN - Follow the dispatch of EVN
Technical requirements	Specific standards/ requirements	- Requested Min. effective of solar cells >16%, module cells >15% - Adoped IEC standards for the PV solar pannels, other part follow the existing standards
	Specific EIA requirements	- Not have specific EIA requirements for Solar project - To follow the general EIA requirements
	Local content requirements	- Not have local content requirements for equipment - Regulated indirectly by the Import tax & VAT <i>(tax the imported goods that could be produced in domestic)</i>
Other	Land Acquisition	Procedure for Land acquisition take long time and sometime high cost
	Foreign Investment	No direct restrict. Only restrict when project located in area that potential affect to the National Defense

Color code:


Policy/ requirements that support to the sector development

Policy/ requirements that could affect to the sector development

Policy/ requirements that could restrict to the sector development

Not have specific policy/ requirements

Vietnam

Catalogue	Criteria	Vietnam (Temporary in 2021)
National policy	Law/ regulation on Solar	Incentives Regulations expired in 2021
	Solar develop target/ strategy	The next National Master Plan (PDP8): Not been issued & Not favor to develop solar in 2020-2030
	Solar development program	
Fiscal/ Financial incentives	Pricing/ incentives	FiT expired & No new mechanism
	Corporation Income Tax (CIT) exemption/ incentives	- Exempted 100% CIT in the first 04 years,  CIT in the next 09 years - Apply CIT at 10% within 15 years from CO
	Support from the financial institutions	Financial Insitutes will only support only when the project have PPA
Off-taker	PPA	EVN will only sign PPA when new regulation is announced
	Guarantee from offtaker	- Guarantee from off-taker (EVN) via PPA - Some projects faced with the curtailment risk (National Grid was overloaded).
Grid	Accessible to the national/ local grid	- Can access to the national grid after got approval from Government (MOIT)/ EVN - Follow the dispatch of EVN
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Uncertain in Policy

(Other factors remaining unchanged)



“FROZEN”
No new solar project
in 2021

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Thailand

Catalogue	Criteria	Thailand
National policy	Law/ regulation on Solar	- Solar Energy is included in Power Development Plan 2018 (PDP 2018) and Alternative Energy Development Plan (2018-2037) with the clear target of solar energy. - Solar rooftop: MEA and the PEA will buy solar power from private household users, up to a maximum national maximum of 100 MW, at THB1.68 per kWh. However, the household solar rooftop is not yet reached the target.
	Renewable (or Solar) develop target/ strategy	Under PDP and AEDP, Solar target 2018-2037: - Solar : 9,290 MW - Solar hybrid : 2,725 MW
	Renewable (or Solar) development program	- Support technological tools and grassroots solutions including blockchain energy trading schemes and residential and community-based renewable energy
	Subsidies for investor	Feed-in-Tariff, VSPP of Renewable (2020) -Solar farm: 5.65 THB/kWh -Rooftop(residential) capacity 0-10 kWp: 6.85 THB/kWh -Rooftop(building/factory) Capacity > 10-250kWp: 6.40 THB/kWh Capacity> 250-1,000 kWp: 6.01 THB/kWh
Fiscal/ Financial incentives	Corporation Income Tax (CIT) exemption/ incentives	- Exemption or reduction of import tax duties on machinery and raw materials. - CIT: Tax exemption for up to 8 years
	Support from the financial institutions	- Local financial institutions supported financing for solar projects - International financial intuitions support for solar rooftop

Catalogue	Criteria	Thailand
Offtake	PPA	Types of PPA for renewable energy 1. Firm: Standard & long term PPA with 20-25 years 2. Non-firm: 5 years PPA with renewal
	Guarantee from offtaker	- Guarantee from offtaker via PPA.
Grid access	Accessible to the national grid	- Well developed transmission and distribution network - Connection to the transmission grid requires the execution of PPA with MEA, PEA or EGAT
Technical requirements	Specific standards/ requirements for the renewable (solar)	- IEC standard
	Specific EIA requirements for renewable (Solar)	- Not require to do EIA but require to have Code of Practice (COP)
	Local content requirements for equipment	- No local content requirements for equipment
Other	Foreign Investment	- 50% or more of its capital owned by Thai shareholders is Thai entity - 50% of more owned by foreign nationals, a company will be considered a foreign company and subject to certain legal restriction under the Foreign Business Act (FBA)

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Indonesia

Catalogue	Criteria	Indonesia
National policy	Law/ regulation on Solar	Applied PRICE CAP MECHANISM <ul style="list-style-type: none"> - Poorly representing future capital, operating, and fuel cost of PLN - Not considering equity returns for developers - Poorly reflecting the nonfinancial benefits of RE - Is based on previous year's fuel prices - Discourages PLN to deal with projects not subject to the pricing mechanism
	Renewable (or Solar) develop target/ strategy	<ul style="list-style-type: none"> + Target to increase the share of renewables in electricity generation plan from 13% in 2017 to 23% in 2025 - Potential capacity is ranging from 3,397 GW to 19,835 GW, but only 207 GW is currently installed - Solar energy is not the priority in 2019-2028 electricity generation plan (0.9 out of 56.4 GW)
	Renewable (or Solar) development program	35,000 MW electricity program initiated in 2015 aiming to improve electricity access mainly using renewables, but the realization is far from target
Fiscal/ Financial incentives	Subsidies for investor	<ul style="list-style-type: none"> + Governmental compensation for state-owned enterprise in executing any government assignment for the public goods that is not profitable - Still lacks in implementation and financing strategy of the subsidy
	Corporation Income Tax (CIT) exemption/ incentives	<ul style="list-style-type: none"> + investment tax deduction + accelerated depreciation and amortization + VAT exemption on imported goods + import duty exemption + extension of tax loss carry forward
	Support from the financial institutions	<ul style="list-style-type: none"> - Foreign investment restrictions + Direct support from government + Government guarantees + Environmental Fund Management Agency

Catalogue	Criteria	Indonesia
Offtake	PPA	<ul style="list-style-type: none"> - No standard PPA leading to lengthy, complex and unpredictable negotiation - Counterproductive procurement and contracting processes, negotiation practices, BOOT requirements, and change-of-ownership restrictions - Unbalanced risk allocation in power purchase agreements (PPAs) that adversely affect bankability and hence hampers investment (only 35 out of 75 RE PPAs signed in 2017 - 2018 reached financial close and moved to construction)
	Guarantee from offtaker	No specific requirement found
Grid access	Accessible to the national grid	<ul style="list-style-type: none"> - Inadequate power system planning - Poor grid management practices - Poor grid flexibility - Inadequate monitoring and supervision
Technical requirements	Specific standards/ requirements for the renewable (solar)	No specific requirement found
	Specific EIA requirements for renewable (Solar)	No specific requirement found
	Local content requirements for equipment	High local content requirements prior to establishment of a market large enough to achieve domestic manufacturing economies of scale

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Not have specific policy/ requirements

Philippines

Catalogue	Criteria	Philippines
National policy	Law/ regulation on Solar	Solar, along with wind, is included in the 10% capacity intended for peak demand
	Renewable (or Solar) develop target/ strategy	Liberalisation of the energy sector makes the coordination toward transition a challenge
	Renewable (or Solar) development program	Slow/non-implementation of net-metering mechanism hinder the deployment of rooftop solar PV
Fiscal/ Financial incentives	Subsidies for investor	FIT capacity has been reached for the solar technology and uncertain about the next FIT scheme
	Corporation Income Tax (CIT) exemption/ incentives	Fiscal incentives to induce investments
	Support from the financial institutions	Limitations on foreign investments and banks still finance coal projects

Catalogue	Criteria	Philippines
Offtake	PPA	Contracted supply are primarily dominated by coal and natural gas power plants, from the purchase power agreements contracted
	Guarantee from offtaker	No specific requirement found
Grid access	Accessible to the national grid	Effective integration of solar in the power grid needs coordination of every stakeholder in the power sector
Technical requirements	Specific standards/ requirements for the renewable (solar)	No specific requirement found
	Specific EIA requirements for renewable (Solar)	No specific requirement found
	Local content requirements for equipment	No specific requirement found

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Timor-Leste

Catalogue	Criteria	Philippines
National policy	Law/ regulation on Solar	East Timor's institutional framework areas and activities are still in the very early stages of capacity development. Electricity in East Timor's rural areas is not considered an important priority
	Renewable (or Solar) develop target/ strategy	- From 2003 to 2021, have installed solar lighting and power to more than 2,000 homes and over 100 community centers, orphanages, schools and hospitals in remote rural villages - According to Timor-Leste Strategic development plan 2011-2030, by 2030 All the rural households in Timor-Leste will have access to electricity either by the conventional expansion of the electricity system or through the use of renewable energy
	Renewable (or Solar) development program	Recently, Prime Minister of Timor-Leste and the South Korea's Ambassador to Timor-Leste, discuss the possibility of partners in supplying the electricity through the installation of solar panels on the rural area
Fiscal/ Financial incentives	Subsidies for investor	No specific requirement found
	Corporation Income Tax (CIT) exemption/ incentives	Exemption of import duties on renewable energy equipment
	Support from the financial institutions	The banks finance the petroleum so the renewable energy is still delay

Catalogue	Criteria	Timor-Leste
Offtake	PPA	The principal power plant, contracted supply are primarily dominated by imported fossil fuel and power outages are common from the purchase power agreements contracted
	Guarantee from offtaker	No specific requirement found
Grid access	Accessible to the national grid	The Electrification Plan is now integrated into the overall development plans for the nation to establish the long-term energy requirements in Timor-Leste
Technical requirements	Specific standards/ requirements for the renewable (solar)	No specific requirement found
	Specific EIA requirements for renewable (Solar)	No specific requirement found
	Local content requirements for equipment	No specific requirement found

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Summary Table & Findings

Catalogue	Criteria	Vietnam	Thailand	Indonesia	Philippines	Timor-Leste
National policy	Law/ regulation on Solar					
	Solar develop target/ strategy					
	Solar development program					
Fiscal/ Financial incentives	Pricing/ incentives					
	Corporation Income Tax (CIT) exemption/ incentives					
	Support from the financial institutions					
Offtaker	PPA					
	Guarantee from offtaker					
Grid access	Accessible to the national/ local grid					
Technical requirements	Specific standards/ requirements					
	Specific EIA requirements					
	Local content requirements					
Other	Land Acquisition					
	Foreign Investment					

- Clear & transparent policy frame
- Long-term target to support the sector

- **Incentives are important at early stage**
- Clear/ transparent pricing in long term

- Availability of funding support

- Bankability of PPA

- Accessible to the national grid

- Requirements for local contents could restrict the development at early stage

- Open for foreign investment at early stages

Color code:

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- Not have specific policy/ requirements

Recommendation

Key factors that influence the development of Solar sector:

- **Policy:** the clear & transparent policy framework and long-term target are priorities to support development of Solar sector
- **PPA:** PPA must have a high bankability and flexible for amendment or negotiation.
- **Accessible to the national/ local grid:** Well-developed and stable grid facility, transmission and distribution will make the country suited for solar or renewable energy generation into the system.
- **Funding support from Financial Institutions:** Availability and easy to access funding at low cost of capital will support the development of solar sector.

Factors that policy maker should consider at the early stages:

- Incentive mechanism is necessary to encourage investors to enter the solar sector, payment mechanism is important when market is mature.
- The regulation to attract foreign investors at the early stages should be flexible. At the early stage, domestic investors/developers may have limited experience.
- Requirement of local contents could restrict the development at early stages when the domestic value chain is not available yet.

References

- The World Bank, Global Photovoltaic Power Potential By Country, 2020 ([link](#))
- USAID & NREL, Exploring Renewable Energy Opportunities in Select Southeast Asian Countries - A Geospatial Analysis of the Levelized Cost of Energy of Utility-Scale Wind and Solar Photovoltaics, 2020 ([link](#))
- IEA, Southeast Asia Energy Outlook 2019, 2019 ([link](#))
- IRENA, Renewable Energy Market Analysis: Southeast Asia, 2018 ([link](#))
- Danish Energy Agency, Vietnam Energy Outlook 2019, 2019 ([link](#))
- VietSE, Ability to release wind and solar power capacity by 2022, 2021 - Vietnamese ([link](#))
- GIZ Vietnam, Investment Guidelines for Commercial-Industrial Rooftop Solar, 2021 ([link](#))
- Thailand Renewable Program, 2016 ([link](#))
- IRENA, Renewable Energy Outlook Thailand, 2017 ([link](#))
- Thailand Ministry of Energy, Thailand Alternative Energy Development Plan 2018-2037, 2018 ([link](#))
- Thailand Rooftop Development, 2020 ([link](#))
- Krungsri Research, Industry Outlook 2020-2022: Power Generation, 2020 ([link](#))
- Seven opportunities in Thailand's Solar Energy Outlook, 2021 ([link](#))
- Thailand Ministry of Energy, Thailand Power Development Plan 2015-2036 ([link](#))
- IESR, Indonesia Clean Energy Outlook, 2019 ([link](#))
- ADB, Renewable Energy Tariffs Incentives Indonesia, 2020 ([link](#))
- IESR, Unleashing Indonesias Solar Potential, 2021 ([link](#))
- A. Gulagi et al.,ransition pathway towards 100% renewable energy across the sectors of power, heat, transport, and desalination for the Philippines, 2021 ([link](#))
- USAID & DOE, Greening the Grid: Solar and Wind Grid Integration Study for the Luzon-Visayas System of the Philippines, 2018 ([link](#))
- Timor-Leste Strategic Development plan, 2014 ([link](#))
- Renewable Energy Opportunities For Timor-Leste, 2019 ([link](#))



THANK YOU

from TEAM2



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*This study is a preliminary research for YSEALI team project assignment only. All the findings and recommendations are only hypotheses.
Further study is recommended for evaluation and verification.*