WATER AND ENERGY PLANNING FOR A SUSTAINABLE AND SECURE MEKONG BASIN

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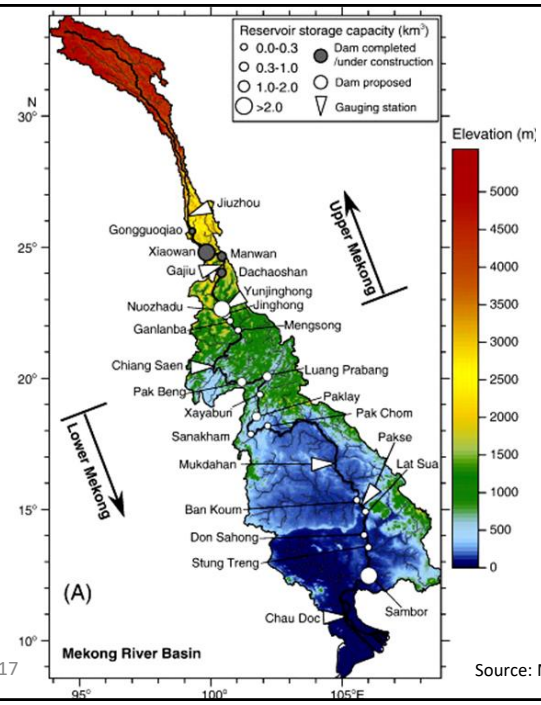
I. A NECESSARY PRELIMINARY – BASIC QUESTION
II. APPROACH FOR WATER & ENERGY PLANNING IN THE MEKONG BASIN
III. RELIABILITY OF WIND AND SOLAR ENERGIES WITH SCIENCE AND TECHNOLOGY PROGRESS

I. A NECESSARY PRELIMINARY – BASIC QUESTION

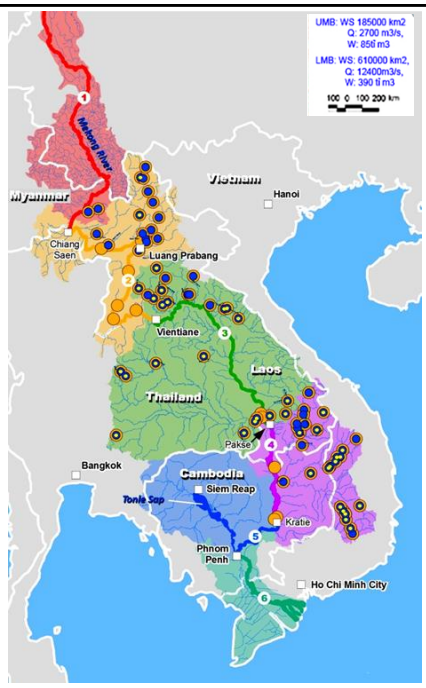
"These workshops will serve as a broad discussion on water and energy security as well as an introduction to Mekong Basin Connect's strategic, system scale water-energy planning approaches. Exploration of pathways for reducing risk in *the Mekong basin as a whole* will be an underlying thread through all presentations, discussions, and interactive activities.
The Mekong Basin Connect program collaborates with stakeholders to develop strategies for integrated water-energy planning and stakeholder-driven processes that reach across borders *to ensure a sustainable and secure Mekong basin*."

I share the point of view on *the Mekong basin as a whole*, and on the necessity *to ensure a sustainable and secure Mekong basin.*

But this raises a basic question: ***Where does begin the Mekong River***, and therefore ***What Mekong Basin we deal with?***



Source: MRC



Longtime we are accustomed with the MRC designation which deals with the LMB. But does it mean so far that the Mekong River begins at the frontier between China, Myanmar and Laos?

(A) *The Mekong River begins at the Tibetan Plateau*.
Its length is 4,350 km (2,703 mi), and it drains an area of 795,000 km^2, (The Mekong River Basin), comprising the Upper Mekong Basin (UMB) and the Lower Mekong Basin (LMB). It discharges 475 km^3 of water annually

(B) *The Mekong River begins at the frontier of China, Myanmar and Laos*.
Its length is 2,600 km (1,600 mi), and it drains an area of 615,000 km^2 (the Lower Mekong Basin).

♦ But differences are not about figures. The fundamental difference is that in this case ***the "Mekong River" has no source***.

What happens if the LMB depends totally on what the "Mekong River" receives from the Lancang River, the Mekong in the Chinese territory. In other words, a *sword of Damoclès* is hanging on the LMB, almost once the Mensong dam finished.

If the question on the Mekong River is not clearly and correctly answered, what our workshops plan for the LMB is like sandy castles built on the beach.

NECESSARY CHANGES IN UNDERSTANDINGS

1. ***Scientifically*** the Mekong River is a whole from Tibetan Plateau. Its water must be considered as *a common asset of all countries in the basin.* It is ***fundamental and urgent*** to recognize this reality.

2. On the other part, the ***geopolitical context*** in the region having been changed deeply since 1957, 1995 justifies fully this understanding.

3. In the context of ***Global Climate Change***, *the scarcity of freshwater* has been predicted as well as many uncertainties. *Extreme events* might occur more frequently with stronger intensities and longer duration. *Good governance of Mekong water resources* is required to reduce adverse impacts.

4. The "*Battery for SEA*" *could not be sustainable*. Hydroelectric dams will destroy irreversibly the Mekong and its hydrological zones, while the interest parts going to the Lao Government and riverians are still problematic. The BCA on the 3 pillars, *economic*, *environmental* and *social* must be done objectively in order to avoid ***regret decisions***.

AND ACTIONS

1. The 6 riparian countries have to develop *a mechanism for using water resources*, in which the rights and interests of each country must be coupled with responsibilities and obligations towards the whole basin, *in the spirit of cooperation for co-development*.

2. To manage well the water of the Mekong and the risks of climate change, *sharing of hydrological data and the operation rules* of the hydropower cascade among the countries in the basin must be an obligation.

3. All projects exploiting the water of the Mekong must be justified in light of environment impact assessment on the whole basin in short, medium, and long terms.

4. MRC must extend to the whole basin, while the Langcang Mekong Cooperation (LMC) must operate based on the recognition that *the Lancang-Mekong is a whole river*; its water is a *common asset of all countries in the basin*. MRC and LMC must be governed by an ***international treaty***.

5. The 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses is a good reference. The 1995 Mekong Agreement is also a good reference for drawing experience to come up with more binding terms.

There are many similarities between the Mekong and the Rhine (Rhin, Rhein, Rijn). The international agreement terms of the Rhine governing the use of the Rhine water could also be used as a reference.

II. APPROACH FOR W&E PLANNING IN THE MEKONG BASIN

1*. Could it exist a sustainable battery coming from hydropower dams on the mainstream of the Mekong River in the LMB?* depends on following considerations:

♦ Great dependence on the flow coming from UMB. It should be noted that downstream countries don't have *hydrological data* of the Mekong in the UMB, as well as *the operation rules* of the Chinese hydropower cascade.

♦ Many uncertainties due to the Global Climate Change. *Extreme events* might occur more frequently with stronger intensities and longer duration.

♦ LMB hydropower cascade will change irremediably the flow of the Mekong and the hydrological – ecological zones of the LMB. (Figure).

♦ Beneficiaries of hydropower stations on the Mekong mainstream could be neither the riverians nor the Lao and Cambodia governments, but the investors. For their interest, environmental problems are not their worries. They look at the competition between hydro-electricity and emerging renewable wind and solar energies.

♦ *It is not evident* that the Benefice–Cost Analysis of the battery hydro-electricity based, on the 3 pillars Economic, Environmental and Social is positive in short, medium and long terms.

***2**. The causal nexus between Water and Energy must be considered wider .*

♦ *Water, Energy, Health, Agriculture* and *Biodiversity* are the 5 elements necessary for the sustainable development of livelihoods of riparians of a river. (World Summit for Sustainable Development 2002, Johannesburg, Report No 263694).

♦ *Water* and *Energy* could not be considered separately from *Ecosystems* :
Between Energy, Water and Ecosystems, there are dependencies and impacts.
Ecosystems as the foundation of the Water – Energy nexus.
Therefore:
All types of energy generation must be planned *with an ecosystem perspective*.
(UN World Water Development Report 2014).

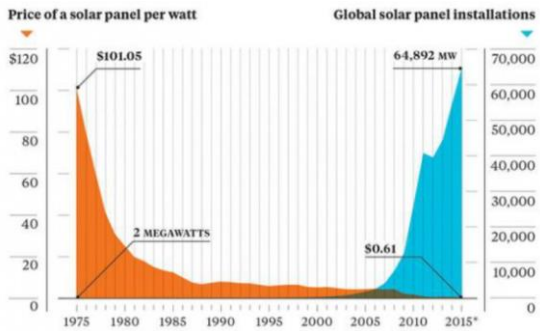
***3**. Emerging renewable energies friendly with Environment become more competitive compared with other "classic" energies, especially hydroelectric energy.*

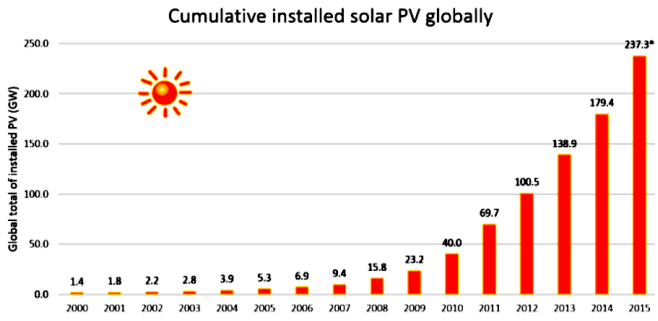
Therefore, the theme of our workshop "*Strategic Water and Energy Planning in the CLV*", *with an ecosystem perspective*, is quite pertinent.

***4**.* With the remarks made above, the planning should be an integrated one, BCA of structure solutions must be done objectively. "*Soft solutions*" (policies, cooperation, investment for no-works projects, …) should have their places.

III. RELIABILITY OF WIND AND SOLAR ENERGIES WITH SCIENCE & TECHNOLOGY PROGRESS

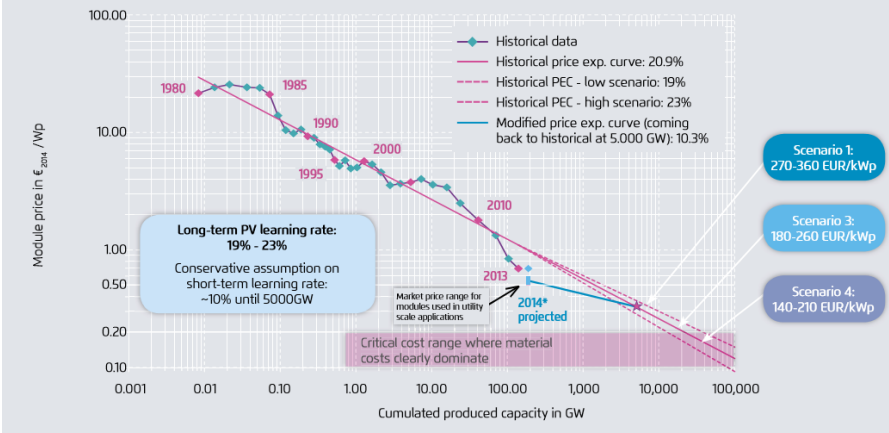
The idea of STIMSON calling for a *Strategic, Basin-wide Energy Planning in Laos* is pertinent in the context of new technology progress in clean, renewable energy, especially *wind* and *solar energies*, in order to avoid the irremediable damage caused to the Mekong River and its Lower Basin.





Solar photovoltaic is already today a low cost renewable energy technology

Future module prices in different scenarios based on the historical "learning rate" Figure E2



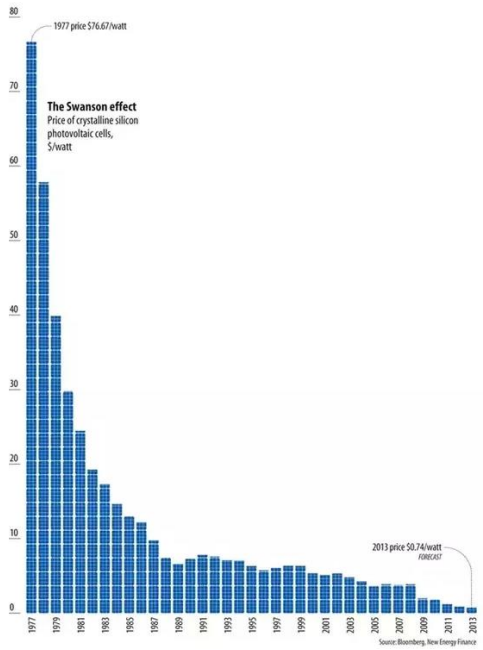
Fraunhofer ISE, own illustration

A power purchase agreement for a 200 MW-solar farm in Dubai was recently signed for 5 ct/kWh (5.84 $ct/kWh). Projects under construction in Brazil, Uruguay and other countries are reported to produce at costs below 7 ct/KWh.

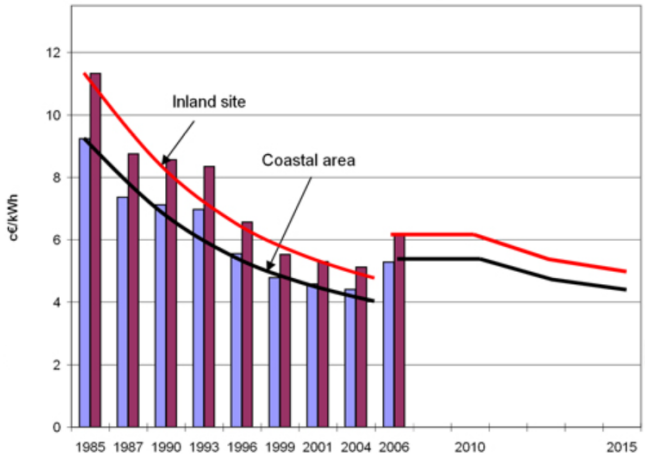
These power generation costs largely confirm the notion that the cost of building and operating a large scale solar photovoltaic power plant is comparable around the world, once market barriers are removed.

Fraunhofer ISE (2015): *Current and Future Cost of Photovoltaics.* Long-term Scenarios for Market Development, System Prices and LCOE of Utility-Scale PV Systems.

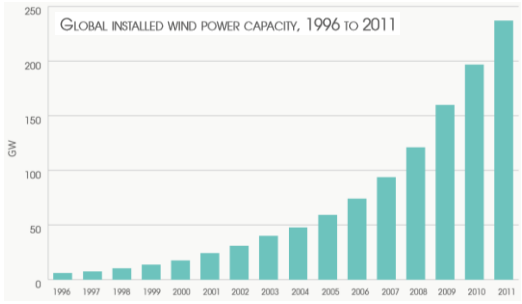
Study on behalf of Agora Energiewende.

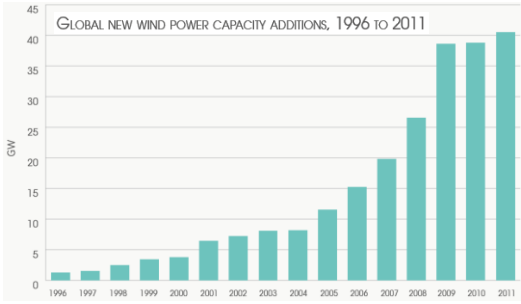


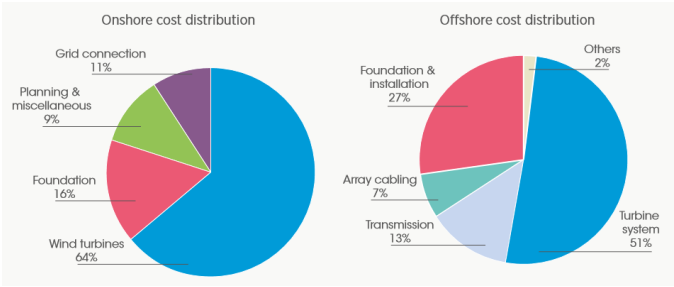
Using Experience Curves to Illustrate the Future Development of Wind Turbine Economics until 2015.



Note: *Costs are illustrated for an average 2 MW turbine installed either at an inland site or at a coastal position.* Source: Risø DTU







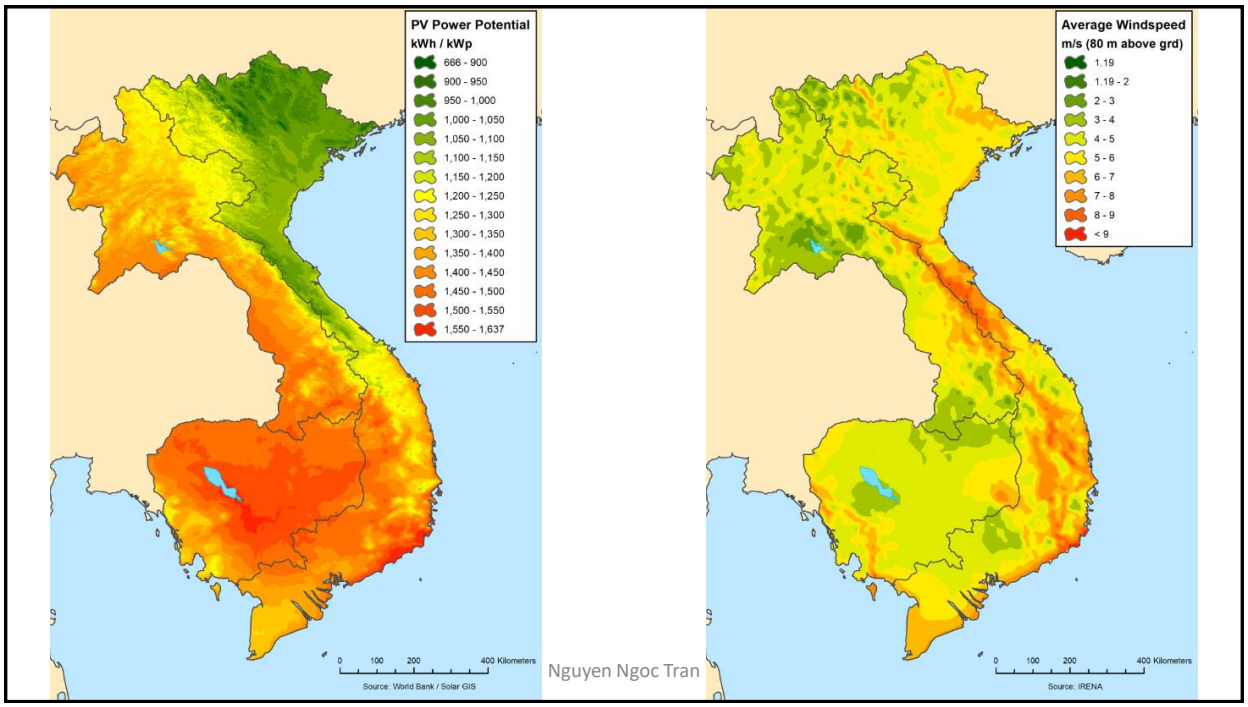
INTERNATIONAL RENEWABLE ENERGY AGENCY
IRENA WORKING PAPER
RENEWABLE ENERGY TECHNOLOGIES: COST ANALYSIS SERIES, Vol 1. WIND POWER
June 2012

Informations hereafter extracted from

GLOBAL WIND ATLAS (2017)
https://globalwindatlas.info/

GLOBAL SOLAR ATLAS (2016)
http://globalsolaratlas.info/

concerning Cambodia, Laos and Vietnam are useful for the feasibility evaluation of alternative solutions to the battery based on hydroelectricity.



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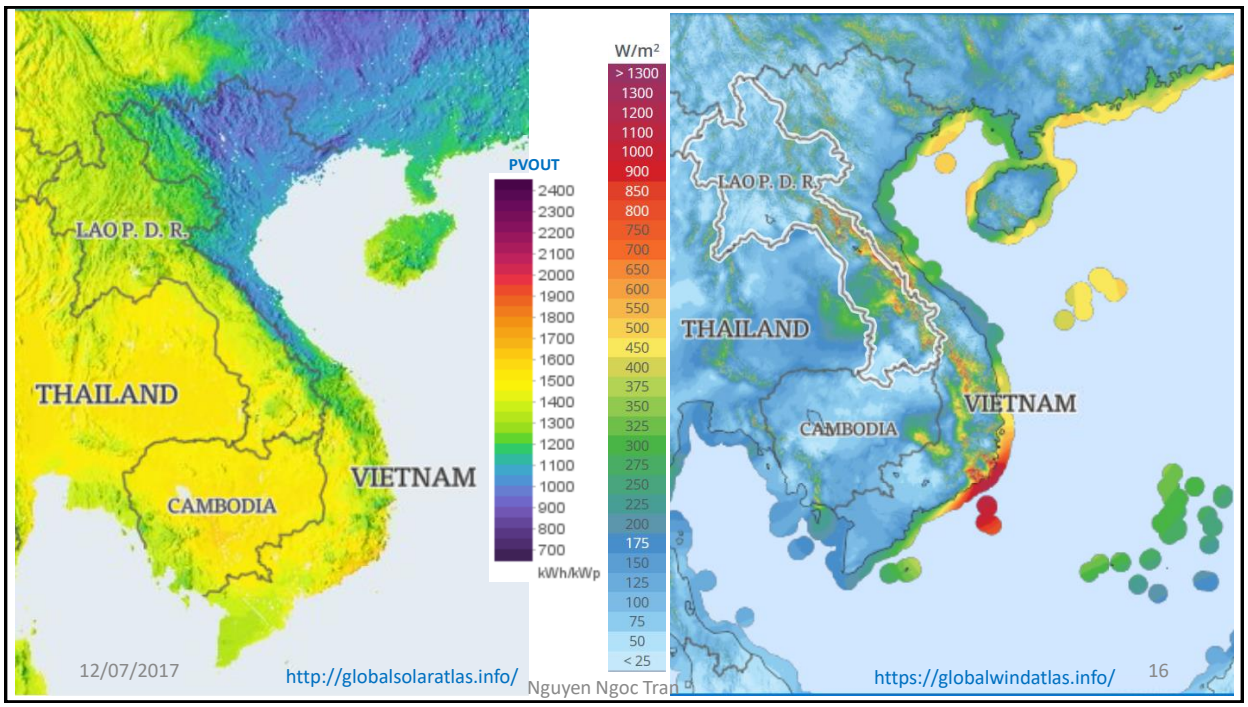

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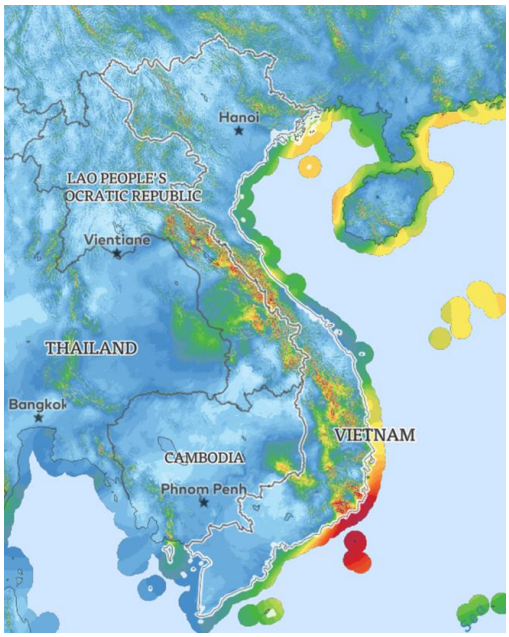
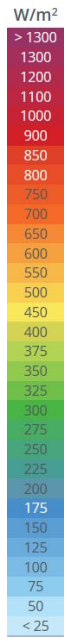
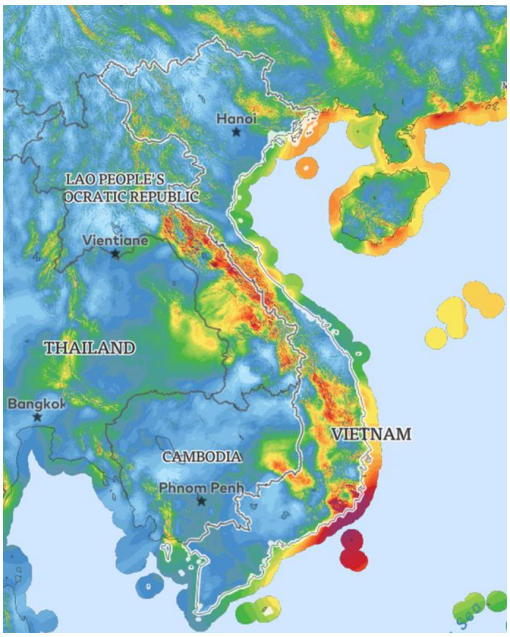
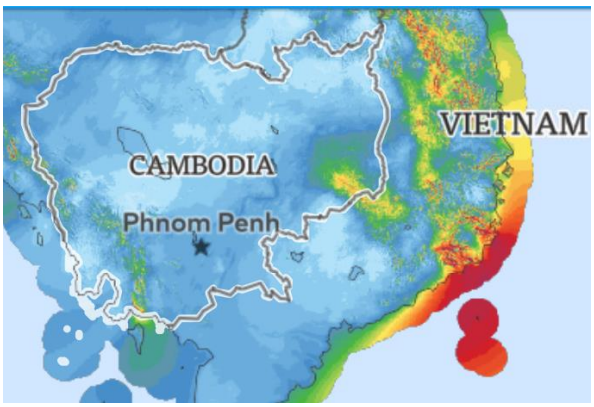


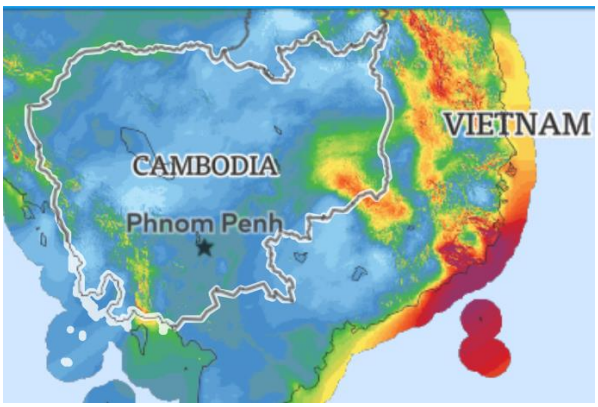




Data for 10% windiest areas
615 W/m² H= 100m 7.79 m/s

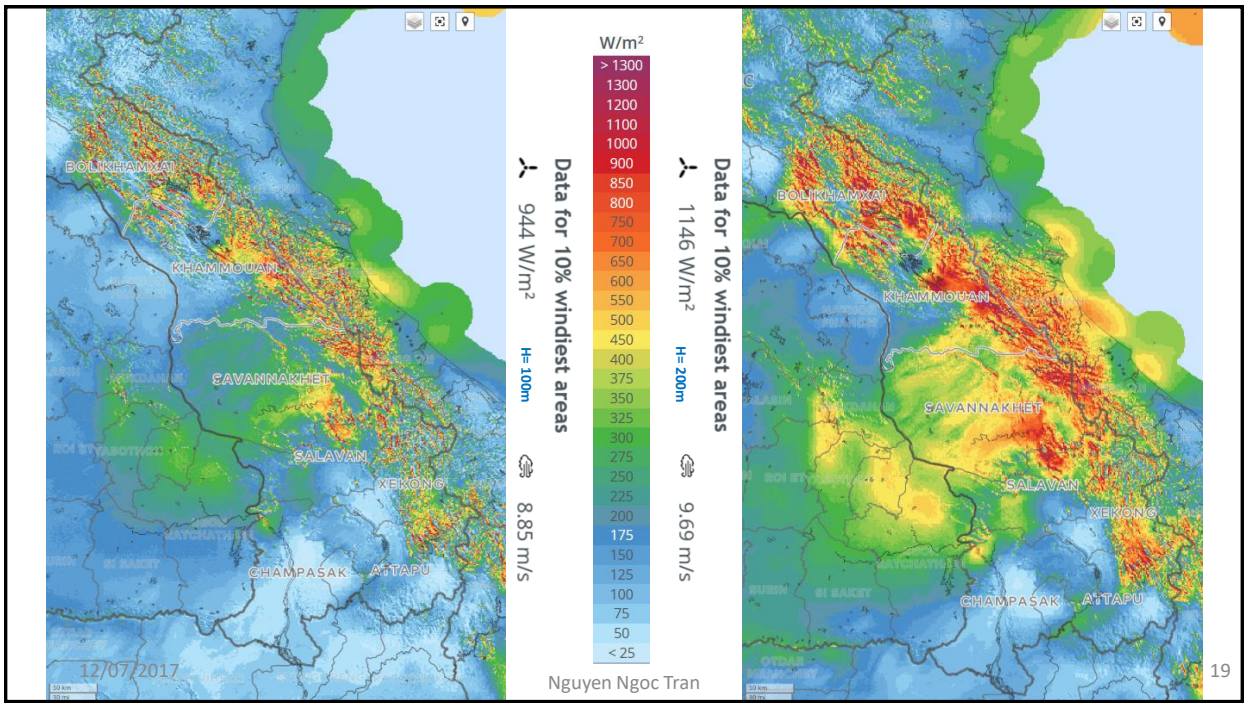
Data for 10% windiest areas
782 W/m² H= 200m 8.57 m/s





Data for 10% windiest areas Height: 100m
242 W/m² 5.71 m/s

Data for 10% windiest areas Height: 200m
353 W/m² 6.54 m/s


W/m²
> 1300
1300
1200
1100
1000
900
850
800
750
700
650
600
550
500
450
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
< 25
Data for 10% windiest areas
1146 W/m²
H= 200m
9.69 m/s
Data for 10% windiest areas
944 W/m²
H= 100m
8.85 m/s
BOLIKHAMXAI
KHAMMOUAN
SAVANNAKHET
SALAVAN
XEKONG
CHAMPASAK
ATTAPU
12/07/2017
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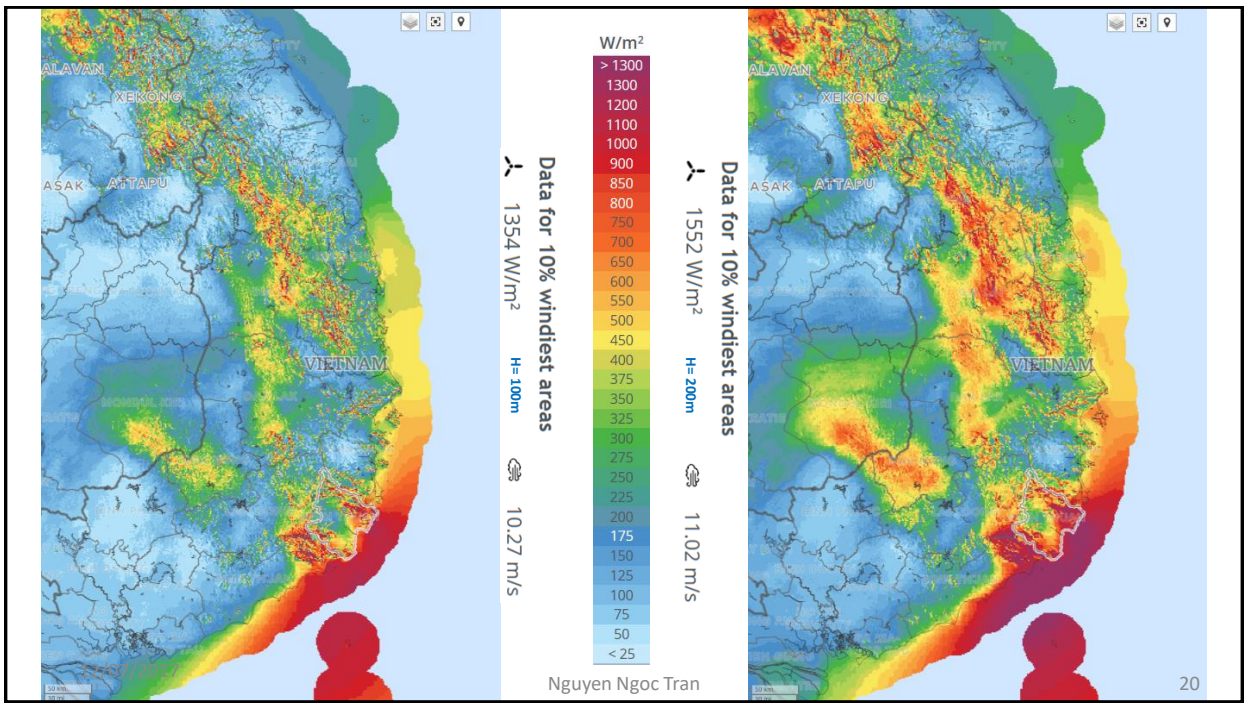
W/m²
> 1300
1300
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700
650
600
550
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450
400
375
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325
300
275
250
225
200
175
150
125
100
75
50
< 25
Data for 10% windiest areas
1552 W/m²
H= 200m
11.02 m/s
Data for 10% windiest areas
1354 W/m²
H= 100m
10.27 m/s
SALAVAN
XEKONG
ASAK
ATTAPU
VIETNAM
Nguyen Ngoc Tran
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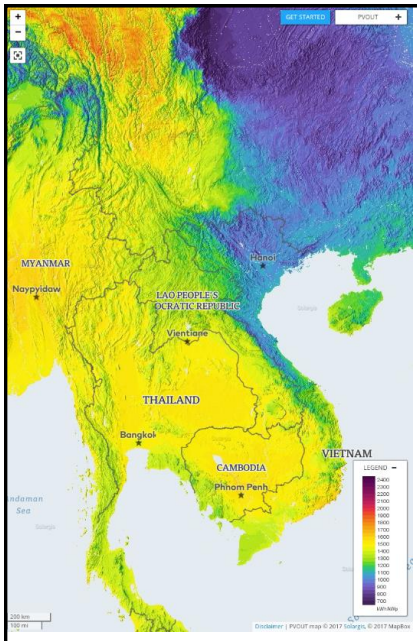
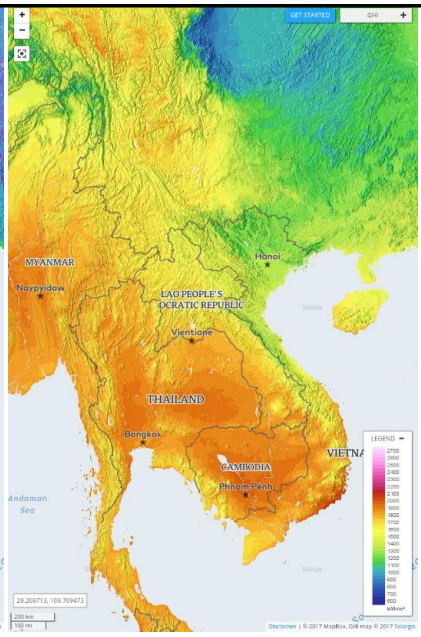
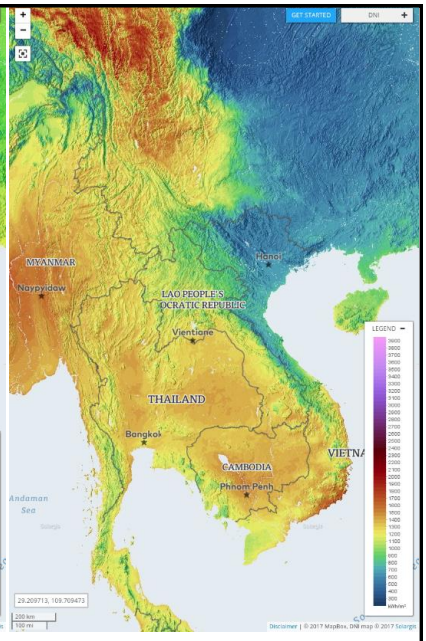


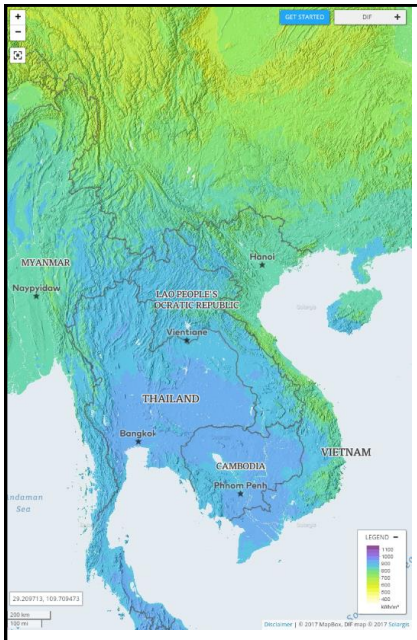
Photovoltaic electricity Output



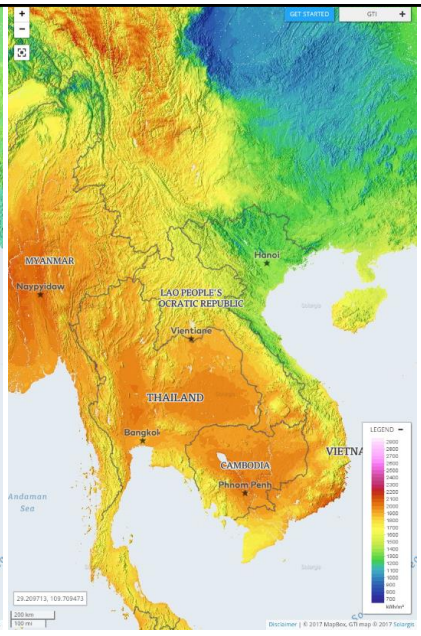
Global Horizontal Irradiation



Direct Normal Irradiation



Diffuse Horizontal Irradiation



Global Tilted Irradiation

Optimum Angle of PV modules

	PVOUT	GHI	DNI	DIF	GTI	OPTA	TEMP	ELE
	kWh/kWp per day	kWh/m2 per day	kWh/m2 per day	kWh/m2 per day	kWh/m2 per day	^{0}/180^0	^{0}C	meter
Pakbeng	3.74	4.545	3.011	2.4	4.816	22	22.2	458
Xayaburi	3.8	4.608	3.156	2.356	4.879	22	22.2	469
Vientiane	3.989	4.899	3.518	2.436	5.164	21	25	171
Bolikhamsay	3.945	4.833	3.551	2.353	5.115	22	24.4	162
Khammouan	3.912	4.742	3.37	2.395	4.981	20	21.5	534
Savannakhet	4.033	4.978	3.592	2.447	5.205	19	24.8	144
Pakse	3.995	4.945	3.529	2.416	5.167	19	24.9	278
Don Sanhong	4.123	5.184	3.8	2.458	5.381	18	26.3	82
Kpg Cham	4.266	5.438	4.093	2.447	5.57	14	27	16
Phnom Penh	3.955	5.348	3.937	2.482	5.448	13	26.9	11
Krakor T.Sap	4.255	5.4	4.066	2.433	5.551	15	27.4	8
Kpg Chnang	4.263	5.427	4.123	2.397	5.567	14	26.8	9
Kratie/BPhuoc	4.118	5.236	3.814	2.471	5.381	15	26.3	101
Ktum/Glai	4.121	5.093	3.83	2.384	5.285	18	22.3	604
GL/ĐL/Ra/Mo	4.121	5.2	3.83	2.482	5.359	16	25.5	150
Phan Rang	4.362	5.592	4.619	2.247	5.677	11	26.4	5
Mũi Né	4.334	5.545	4.438	2.312	5.641	12	27.1	15
Núi Bà Đen	4.06	5.178	3.674	2.488	5.315	14	27.1	49
Ho Chi Minh	3.526	4.19	3.419	2.479	4.848	12	27	3
Tịnh Biên	3.899	4.984	3.392	2.504	5.085	12	26.8	73
Hòn Chông	3.879	4.926	3.334	2.405	5.016	12	27.8	2
Mũi Nai	3.838	4.874	3.266	2.427	4.964	13	27.5	5
Cần Thơ	3.489	4.729	3.036	2.537	4.795	11	26.9	1

PVOUT : Photovoltaic electricity Output
GHI : Global Horizontal Irradiation
DNI : Direct Normal Irradiation
DIF : Diffuse Horizontal Irradiation
GTI : Global Tilted Irradiation
OPTA : Optimum Angle of PV modules
TEMP : Temperature
ELE : Elevation

THANK YOU FOR YOUR ATTENTION