TNA & Technology Action Plan (TAP):

Experiences, lesson learned and Barrier Analysis from Thailand energy sector

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Inception Workshop for Low Carbon Technology Assessment
"Enabling Implementation of INDC/Paris Agreement in Vietnam"
September, 27th 2016

UNFCCC @ 1992

Common,
but differentiated responsibilities
and respective capabilities

Precautionary… cost effective

Since 1995, Parties under UNFCCC have considered how to enhance climate technology development and transfer

To support enhanced action on
climate change

Vương quốc Thái Lan

All are 2015 data

Population: 67.9 million (45% urban)

GDP_{ppp} = 1.05 Trillion$ (0.3% growth)

Tot primary energy supply=135,463 ktoe

Final energy consumption = 77,881 ktoe

GHG = 305.52 *Mt-CO_2eq (2011 data)*

(Energy 72.97%)

0.9% of the world

On Paris agreement

- *Signature Apr 22nd, 2016*
- *Ratification Sept 21st, 2016*

On NAMAs (Pledged Dec 9th, 2014) for energy & transport sector **Period: Now to 2020**

Plan to reduce its GHG by **7%** *(domestically supported = 24 Mt-CO_2eq) to* **20%** *(from domestically + internationally supported = 74 Mt-CO_2eq) below the business-as-usual (BAU) level by 2020.*

On iNDC (submitted Oct 1st, 2015) for economy wide **Period 2020-2030**

Intends to reduce its greenhouse gas emissions by **20 %** *from the projected business-as-usual (BAU) level by 2030. (BAU = 555 Mt-CO_2eq in 2030, Target = 111 Mt-CO_2eq)*

TNA and TAP Timeline for Thailand

2010

May '10 First discussion between ONEP and STI about TNA

Nov'10 Agreement for conducting TNA (STI and UNEP)

2011

May'11 Contact with 4 Consultants (NSTDA, HAII, CCKM, and CMU)

TNA TECHNOLOGY NEEDS ASSESSMENT

Water Resource Management | Agriculture | Modeling | Energy

2012

Jul'12 Submitted TNA / TAP Report to UNEP

Sep'12 Submitted TNA Report to National STI Policy Committee

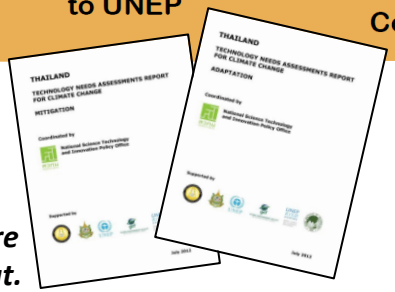
Oct'12 Submitted TNA Report to STI Executive Committee

Nov'12 Submitted TNA Report to National Climate Change subcommittee

Nov'12 Submitted TNA Report to National Climate Change Committee

TNA/TAP report

- ***Mitigation***
  - ✓ ***Energy***
- ***Adaptation***
  - ✓ ***Agriculture***
  - ✓ ***Water mgt.***
  - ✓ ***Modelling***



Download from UNFCCC TNA website

TAP report (detail)

- ***Energy***
- ***Agriculture***

2013

The result of TNA is part of Thailand's Climate Change Master Plan (2015-2050)

2014

Technology Action Plan : Mitigation
- Energy

Technology Action Plan : Adaptation
- Agriculture

2015

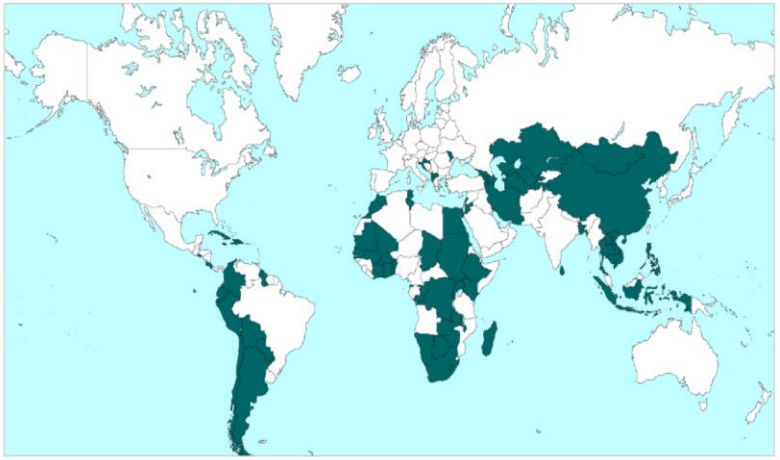
TNA results is part of the draft of Thailand INDC

Source: Thailand NDE by Surachai Sathitkunarut (2016)

TNA countries & Thai structure and institutional

TNA TECHNOLOGY NEEDS ASSESSMENT

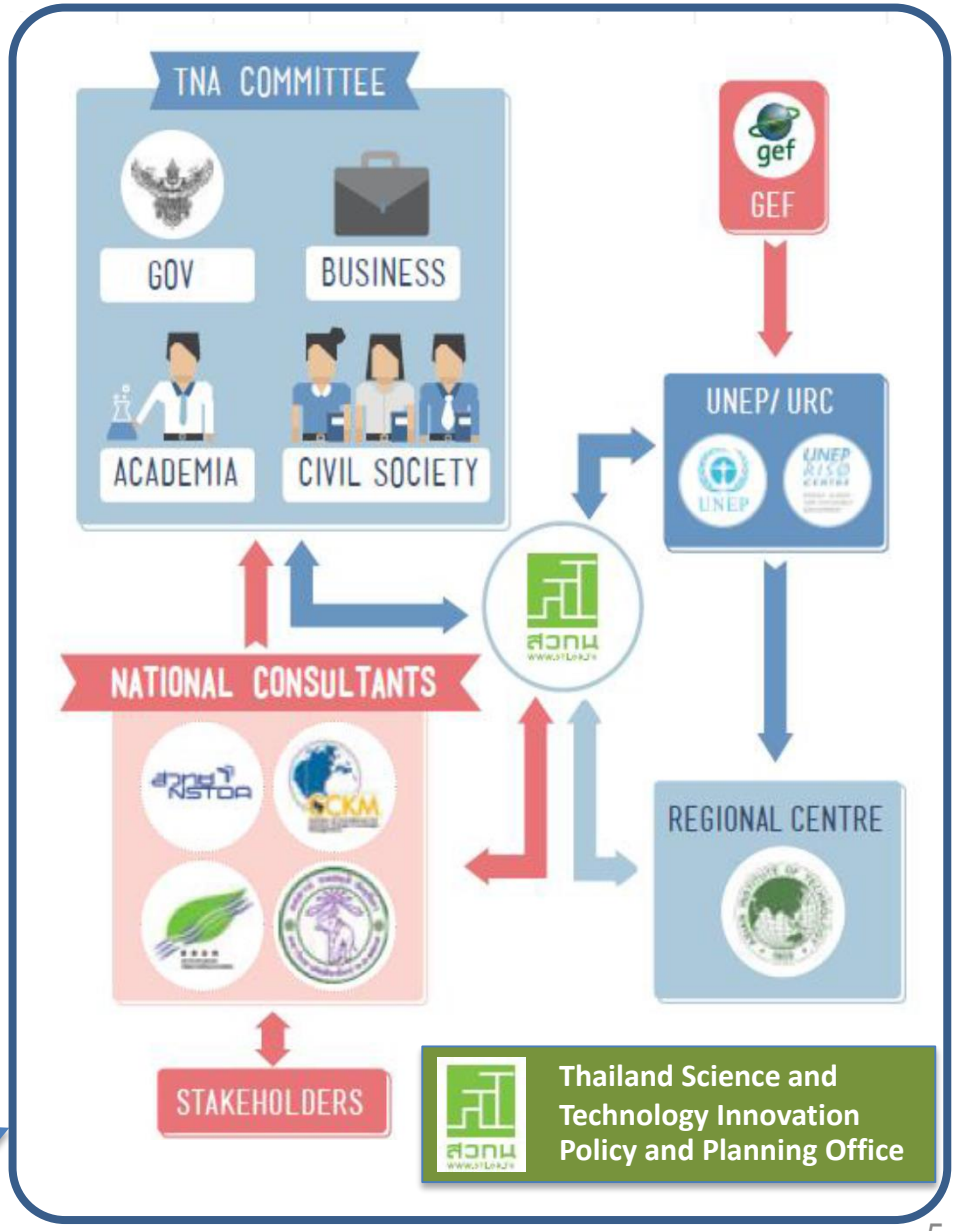
Participating countries



TNA Phase I countries

TNA Phase I supported 36 countries between 2009 and 2013. TNA reports were submitted by 11 countries in Africa and Middle East, 13 countries in Asia and Eastern Europe, and 8 in Latin America and Caribbean. These countries were:

including Vietnam and **Thailand**



Source: Thailand NDE by Surachai Sathitkunarut (2016)

TNA & TAP Processes for Thailand

Experts & Stakeholders → **Sector Identification** ← Literature Review

↓

Experts & Stakeholders → **Technology Needs Assessment (Prioritized)** ← Literature Review

↓

Barrier Analysis
(capability, accessibility, policy, law & regulation, social perception, user, etc.)

Experts & Stakeholders & National Consultation → **Technology Action Plans**





Framework TNA and TAP-Energy in 2012

Comparison : **Thailand and the world**

Condition: **2^0C & 450 ppm**

Environmental plan

Sources	Details
ONEP	- National Climate change plan
OTP	- National transport plan
Industry	- National Industry plan

Economic plan

Sources	Details
NESDB	- National Economic plan

Energy plan

Sources	Details
MoEnergy	- Policy & Strategy plan - Provincial plan
EPPO DEDE EGAT MEA PEA	- Power Development Plan (PDP) - Energy efficiency plan (EEP) - Alternative energy development plan (AEDP)

Plan and Data from past and existing energy activity → **Analysis Assessment conclusion** → **TNA and TAP**

Technology Need assessment and TAP (Mitigation)

Suggested measures

Suggested TAP

Existing TAP (adjusted)

New TAP (best practices from other countries)

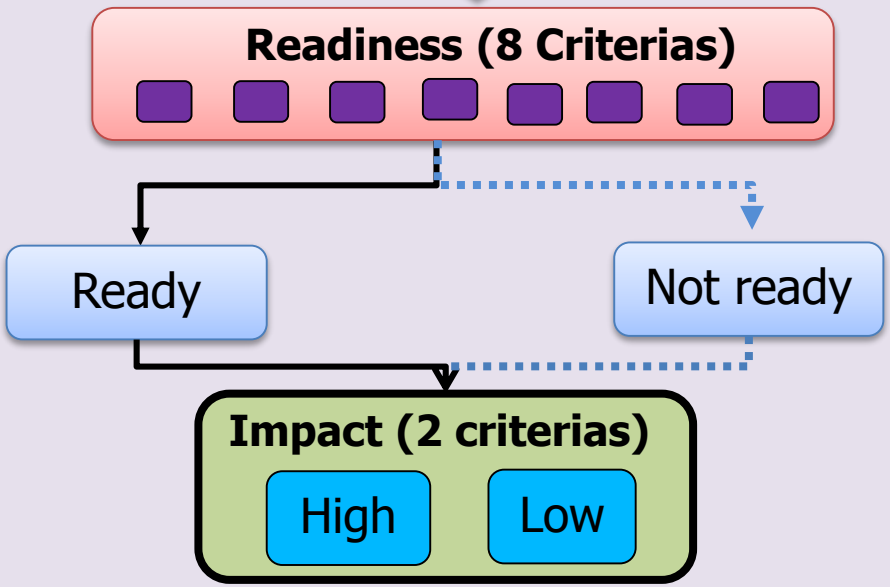
TNA Technology selection

Grouping

Energy sector (list all 34 technologies from national plans)

- 1: Supply
- 2: Renew Energy
- 3: Energy Efficiency
- 4: Others

Multi Criteria



Prioritized Technology

TNA Results

Final consideration → 5 technologies

- **Timeframe/neccessity**
- **TNA Steering committee comments**

Energy Technology Consideration in Thai TNA

4 parts Power Supply and Transformation;

34 *technologies*

Renewable energy (based on AEDP);

Energy efficiency (based on EEP);

Other technology (CCS and smart grid)

Renewable energy
• Solar energy (2)
• Wind energy (1)
• Hydro energy (1)
• MSW (3)
• Biofuels (3)
• Hydrogen (-)
• Biomass (2)
• Biogas (3)
• CNG (1)

Energy efficiency
• Cross-sector
• Industry (4)
• Commercial (2)
• Residential (2)
• Transport (3)

Energy supply
• Power generation/ district cooling (3)
• Oil refinery (1)
• Gas separation (1)
Other technology
• CCS and Smart grid

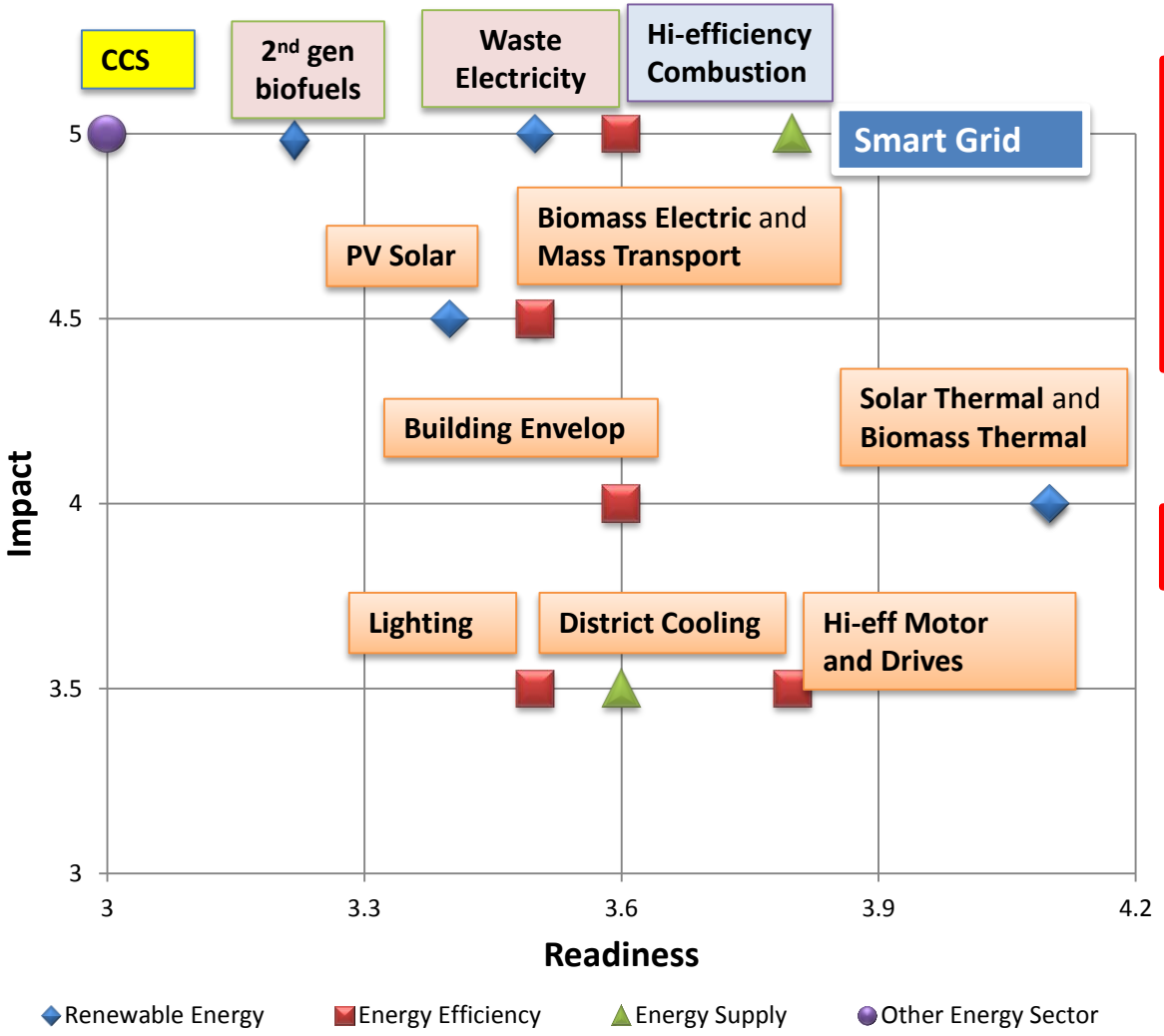
- *Multi-criteria analysis by above sub-sector*
- *Scoring made by energy group experts via meeting and computer system (delphi)*

TNA Criteria setting for Energy sector

- **The Readiness**
  (If ready = 5 : If NOT ready = 1)
- **The Impact**
  (If big impact = 5 : Least impact =1)

Criteria	(a) Assessment (from 1 to 5)	(b) Weight	(c) = (A)*(B) Point
Readiness			
(1) Policy infrastructure including regulatory	5	0.1	0.5
(2) Benefit and cost	5	0.1	0.5
(3) Short-term trend	5	0.1	0.5
(4) Management infrastructure	5	0.1	0.5
(5) Possibility of domestically based production	5	0.2	1
(6) Stakeholder and social acceptance	5	0.2	1
(7) Current technology situation in Thailand (if ready=1)	5	0.1	0.5
(8) Current tech. situation in developed countries (if ready = 5)	5	0.1	0.5
Impact			
(9) Other impacts (social, economic and environment)	5	0.5	2.5
(10) Estimated GHG mitigation of technology	5	0.5	2.5
Grand total score			**10**

TNA Results of technology prioritization



Technology	Readiness	Impact	Total
Smart Grid	3.8	5.0	8.8
Combustion	3.6	5.0	8.6
Waste Electric	3.5	5.0	8.5
2nd gen biofuels	3.2	5.0	8.2
Solar Thermal	4.1	4.0	8.1
Biomass Thermal	4.1	4.0	8.1
CCS	3.0	5.0	8.0
Mass Transport	3.5	4.5	8.0
Biomass Electric	3.5	4.5	8.0
PV Solar	3.4	4.5	7.9
Building Envelop	3.6	4.0	7.6
Motor and Drives	3.8	3.5	7.3
District Cooling	3.6	3.5	7.1
Lighting	3.5	3.5	7.0

Energy Supply | Renewable Energy | Energy Efficiency | Other Energy Sector

TNA Results of technology prioritization

(a) Energy supply

- Smart grid

(b) Renewable energy technology

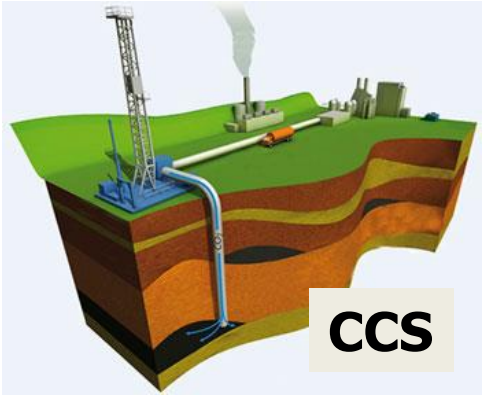
- Waste to power (power generation)
- Second generation biofuels

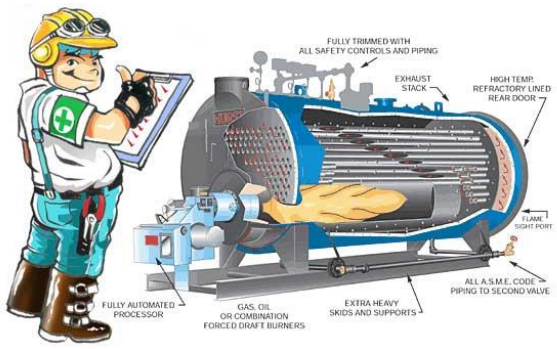
(c) Energy efficiency improvement

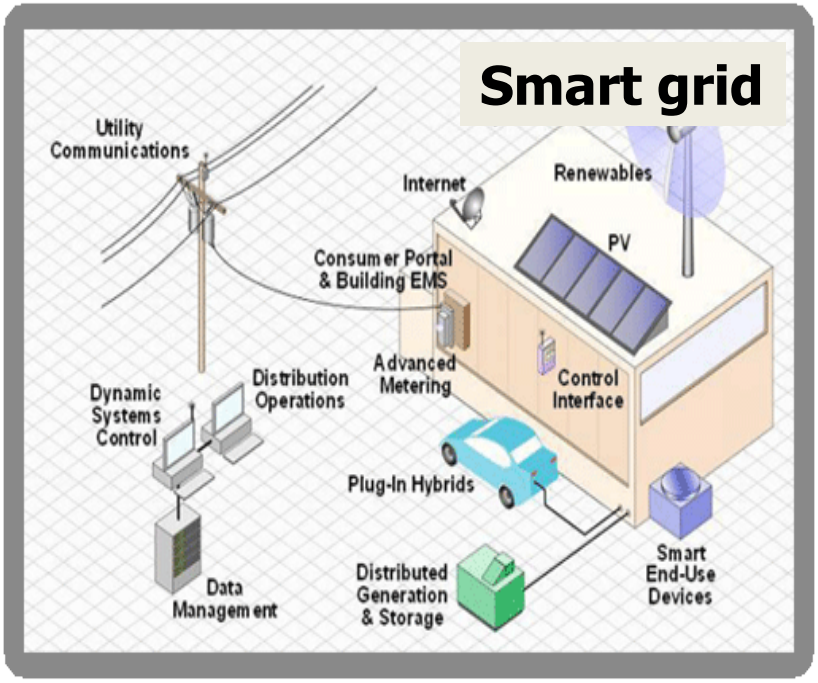
- Fuel Combustion in industry sector (Large and small scale)

(d) Other

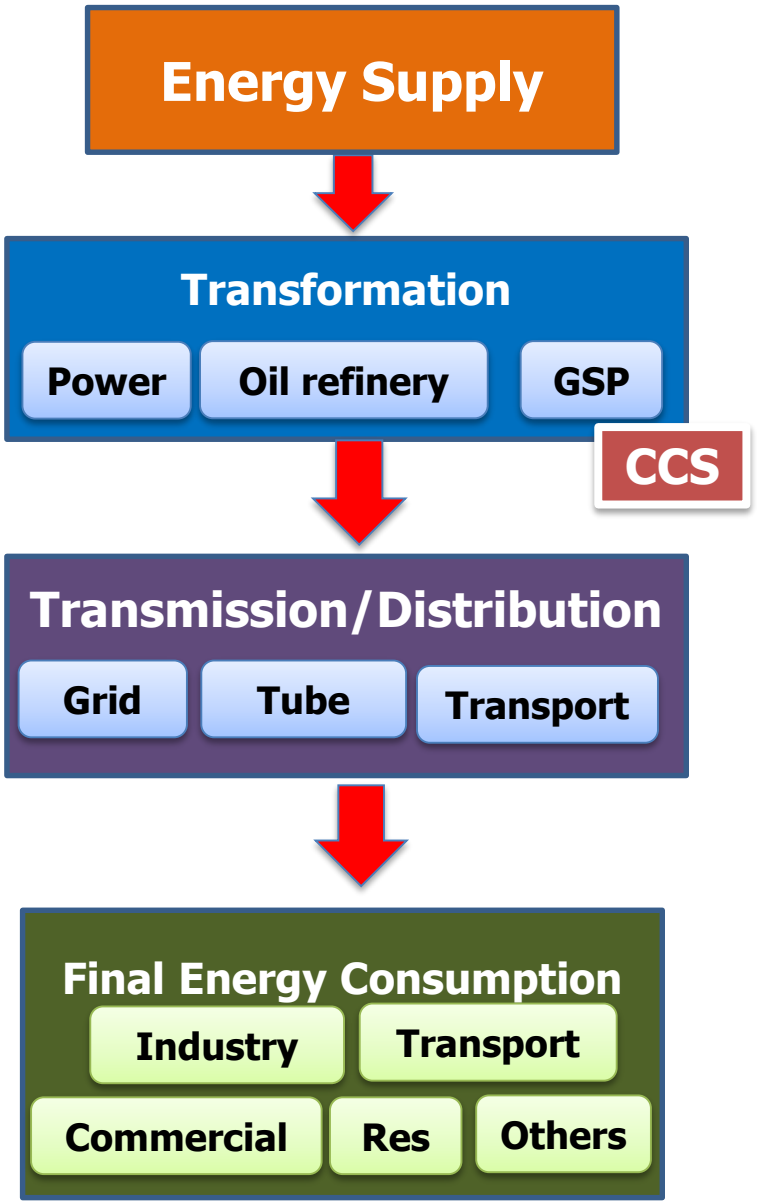
- Carbon Capture & Storage (CCS)







TNA technologies are in all Thai energy levels



4
- Fossil energy (coal **gas oil** others)
- Renewable energy (Solar, wind, biomass, biogas, **MSW, biofuels**)

2 5

1 2 4
- **Power generation (fossil: Thermal, CCGT, diesel) (renewable: Gasification, Thermal)**
- Oil refinery
- Gas separation plant (GSP)
- Heat generation/District cooliing
- Energy planning

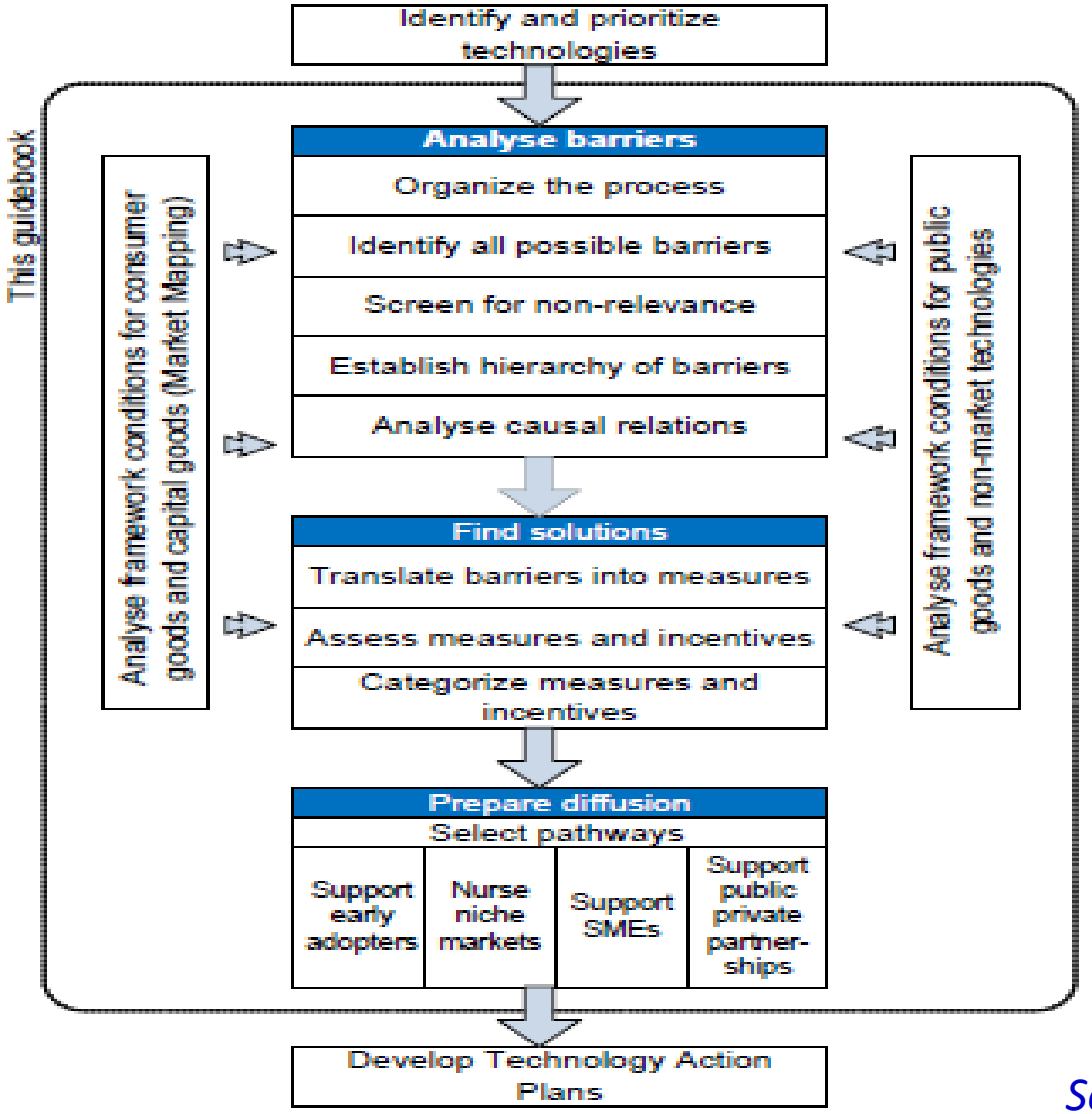
- Energy (power) transmission
- **Energy distribution** 1
- Petroleum/gas transport
- Operation & Maintenance

1.Smart grid
2.Waste-to-power
3.Efficient Burner
4.CCS
5.2nd Gen biofuel

- Energy demand forecast
- Electricity consumption (motors and drives, air compressor, air conditioning, etc.) 5
- **Fuel consumption (transport)**
- **Thermal energy consumption (boiler,** burner**)** 3
- Energy management system (control system)

TNA Prioritized Technologies: 4 sectors

After TNA, then Technology Action Plan (TAP)



Source: UNEP Risøe center

Barriers needed to be focused and analyzed

Major barriers in each prioritized technology have to be considered by experts and policy makers, in short-, medium- and long-term period;

Technology and technical

- Define clearly on our technology gap;

- Import or domestic production including intellectual property rights;

- Transfer period

Finance

- Marginal abatement cost (MAC) curve should be prepared during TNA;

- Seeking international supported in short run and establishment of domestic financial scheme would be real solution in the long run

Policy and Regulatory including institutional framework

- Each prioritized technology should have "clear" policy/plan or roadmap with tangible national target and should deploy in appropriate time;

- Some technologies require new institutional framework and international standards such as CCS, smart grid, EVs;

Capacity building

- Covering related working level (working, engineer, management)

- Networking is very important btw. each technology stakeholder

Challenges and opportunity in TNA & TAP

- **TNA is our personal identity and finding**
  - *Only you would know your real needs along with time period*
- **Climate change technologies with high cost, but high impact on GHG mitigation, should be focused in TNA and TAP**
  - *But have to consider in realistic and tangible technologies*
- **Further technology transfer should request to CTCN (Climate Technology Center & Network) under UNEP and UNIDO**
  - *However, international supported projects for "post-TNA & TAP" may not fast and easy, as we thought*
- **Domestic supported is very important in the long run, by setting up the special financial mechanism for supporting/deploy the technologies listed by TNA&TAP and deploy**
  - *Institutional framework and regulatory*
  - *Long term government fund (with specific objectives)*
  - *Measuring, Reporting, and Verification (MRV) have to be considered*

Alone we can do so little;

TOGETHER we can do so much

: Helen Keller

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