

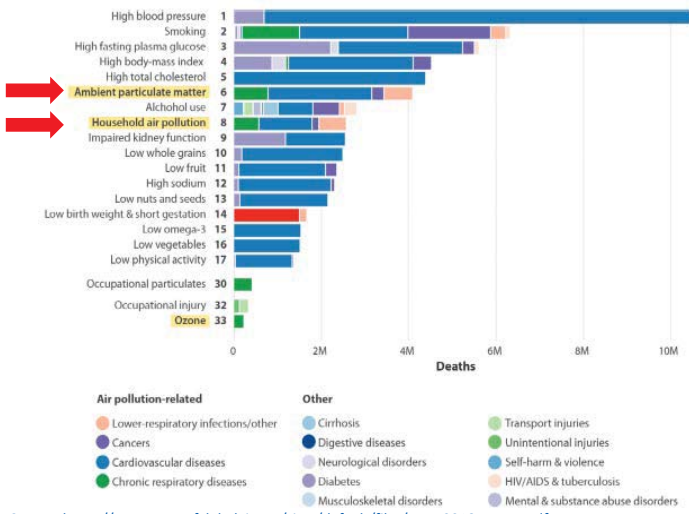
Green Bond Initiative

Andrew Kent Jan, TMB Bank
June 2019

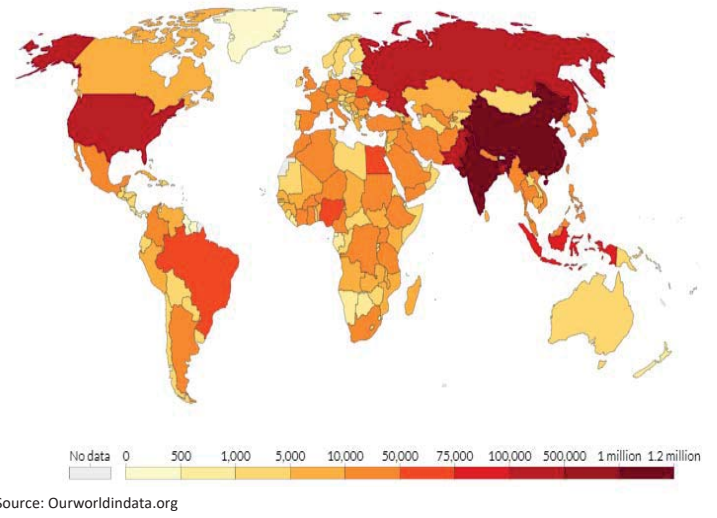
Dust in the air

Airborne Particulate matter (PM) is among top risk factors that causes deaths on global population

Global ranking of risk factors by total number of deaths from all causes (2016)



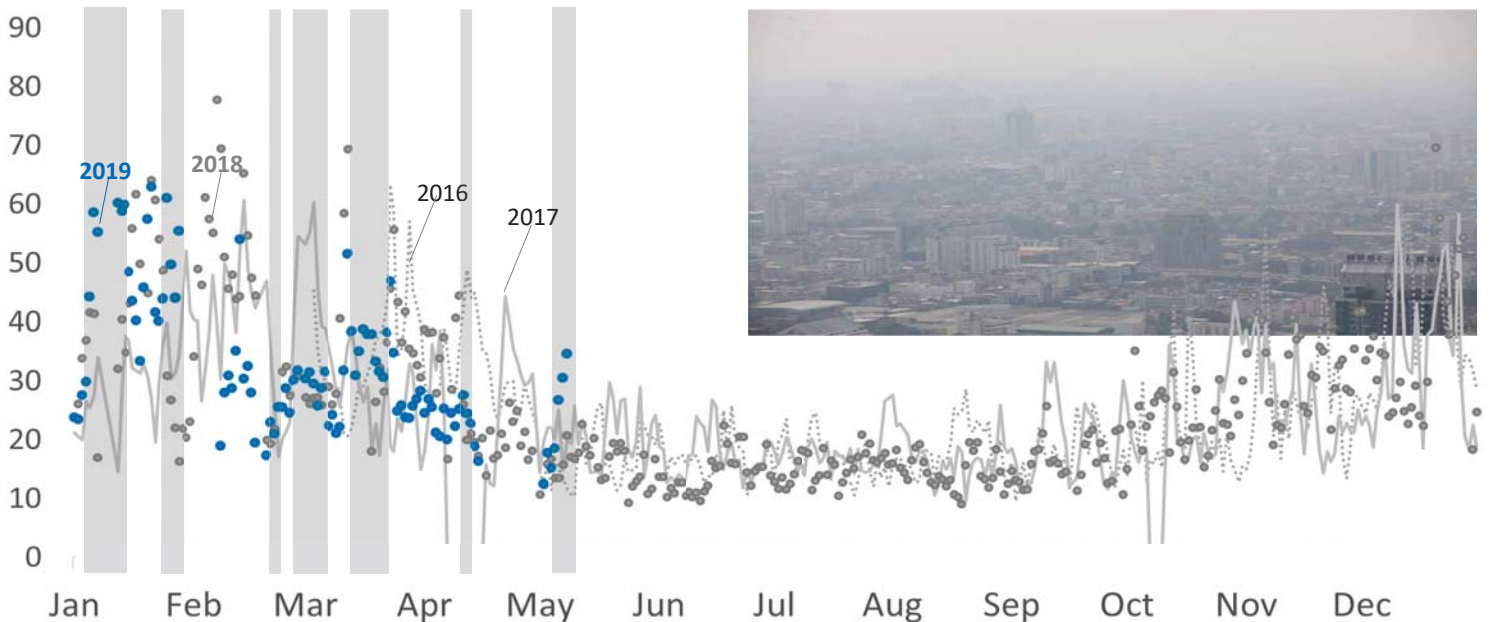
Number of deaths from outdoor air pollution (2016)



- PM = particulate matter (also called particle pollution) which is the term for a mixture of solid particles and liquid droplets found in the air.
- PM2.5 = PM with diameter of 2.5 micron

During Jan – Feb each year, PM2.5 problem is getting worse.

Daily Average PM2.5 concentration (microgram/m³)



- Concentration of PM2.5 reaches its peak during Dec-Feb of the year.
- In 2019, high level of PM2.5 is still observed in late May.

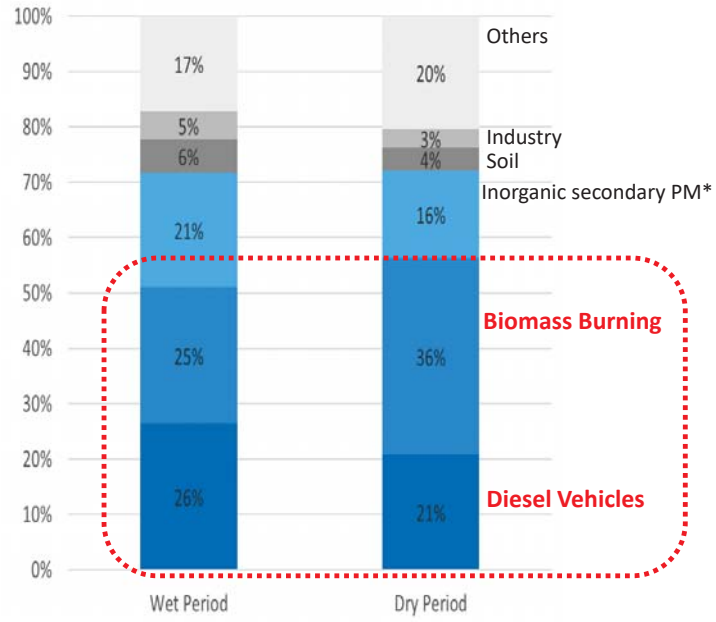
Air Quality Rankings

Top20 Most Polluted Countries

China	999	Hong Kong	76	Russian Federation	50
South Africa	999	Bosnia and Herzegovina	73	Serbia	49
Norway	837	Ireland	73	Armenia	49
Turkey	814	El Salvador	72	Lithuania	48
India	682	Cyprus	69	Croatia	47
Chile	280	Canada	69	Gibraltar	43
Belgium	223	Myanmar	68	Moldova	42
Czechia	217	Jordan	68	Romania	41
Pakistan	189	Ecuador	68	Cambodia	40
Peru	172	Malaysia	67	Denmark	40
Australia	170	Macao	65	Réunion	38
South Korea	170	Saudi Arabia	64	Greece	38
Bahrain	162	Ethiopia	63	Switzerland	38
United Arab Emirates	157	Slovakia	63	Macedonia	37
Mexico	151	Kyrgyzstan	63	Bolivia	36
Thailand	146	Sweden	61	Malta	36
Ukraine	135	Brazil	61	Germany	35
Israel	133	Viet Nam	61	Luxembourg	34
Poland	132	Bulgaria	60	Kosovo	34
United States	126	Sri Lanka	59	Hungary	30
Iran	125	Iceland	59	New Caledonia	28
Indonesia	122	Algeria	57	Slovenia	25
Bangladesh	119	Singapore	57	Kazakhstan	25
Uganda	119	Palestine	56	Liechtenstein	24
Japan	119	Estonia	56	French Guiana	24
Nepal	114	New Zealand	55	Puerto Rico	22
Spain	107	Argentina	54	Andorra	22
Netherlands	104	Italy	53	San Marino	21
Mongolia	99	Portugal	53	Holy See	17
Taiwan	99	Austria	53	Brunei Darussalam	14
Iraq	95	Martinique	53	Guadeloupe	8
United Kingdom	88	Curaçao	53	Monaco	7
Kuwait	80	Finland	52		
France	78	Colombia	52		

Source: <https://aqicn.org/city/bangkok/>

Source of PM2.5 in Thailand



*Pollutant forming in atmosphere due to chemical reaction

Source: Pollution Control Department

Toward Zero Emission

Many countries have set zero-emission target in the next few decades

No sales of conventional petrol and diesel cars and vans by 2040.
Reduce national **vehicle emissions to zero by 2050.**

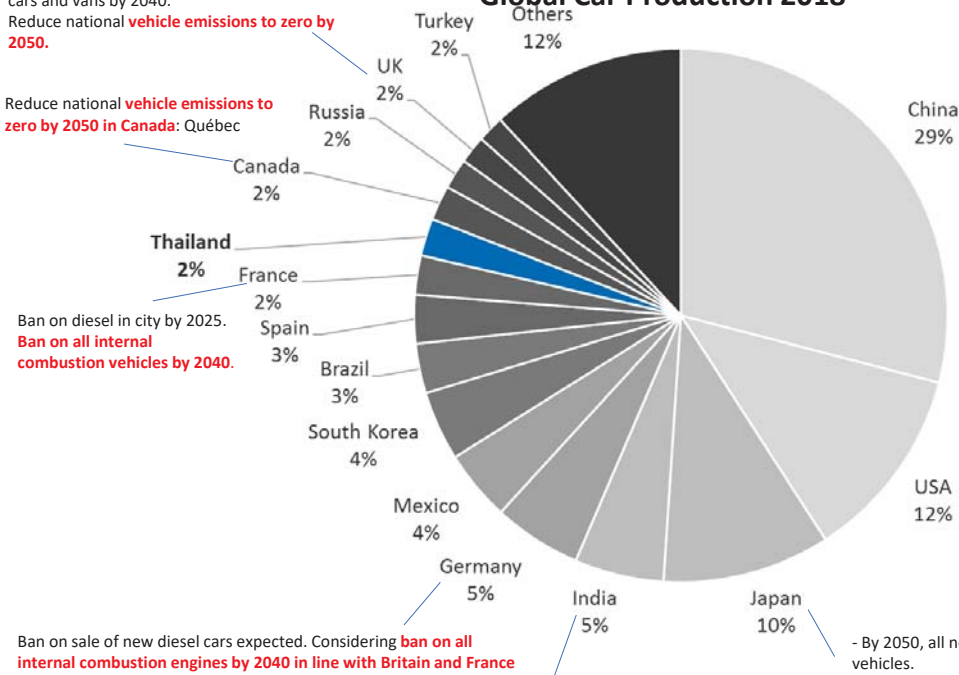
Reduce national **vehicle emissions to zero by 2050 in Canada: Québec**

Ban on diesel in city by 2025. Ban on all internal combustion vehicles by 2040.

Ban on sale of new diesel cars expected. Considering ban on all internal combustion engines by 2040 in line with Britain and France

No new gasoline or diesel vehicles by 2030 (if economical)

Global Car Production 2018



There's a big psychological difference between "we're going to start edging into a transition" and "we're ending gas cars." There's a finality to the latter that, shall we say, stimulates the entrepreneurial imagination.

-- Vox/energy-and-environment

Reduce national vehicle emissions to zero by 2050 in some states: California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, and Vermont

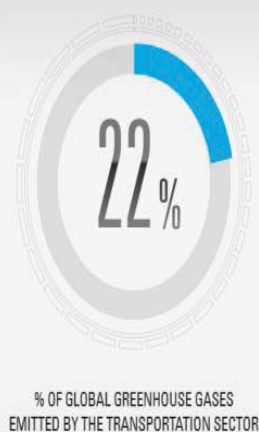
- By 2050, all new cars sold in Japan be electric or hybrid vehicles.
- reduce greenhouse gas emissions of a single passenger vehicle by 90 percent by 2050, compared with 2010 levels.

Switching to electric vehicles (EV) can curb CO2 emissions by 22%. More CO2 reduction is expected since longer range EV can lead to higher rate of EV adoption by consumers.

GREEN

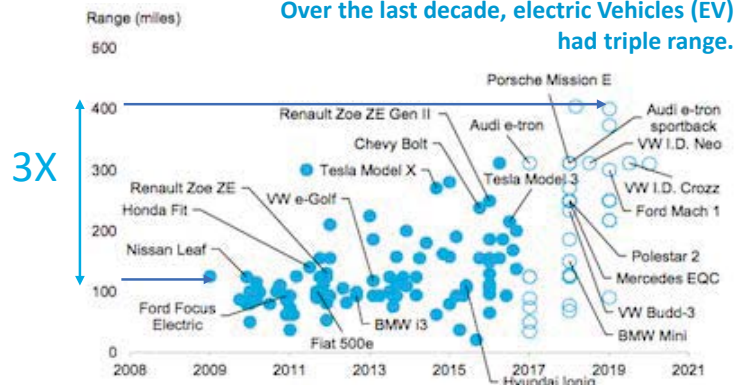
Consumers and regulators concerned about climate change are putting pressure on automakers to reduce CO2 emissions.

Source: Japan Ministry of Economy, Trade and Industry.



Driving Range for select EV models

Over the last decade, electric Vehicles (EV) had triple range.

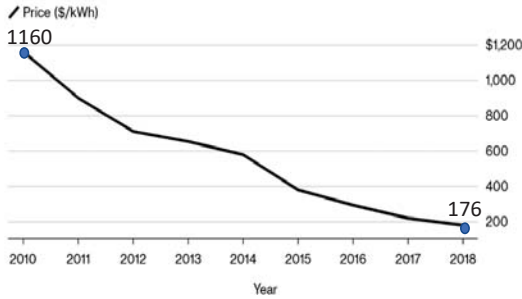


Source: BloombergNEF

Li-ion Battery Price tumbled

Battery Prices Plunge

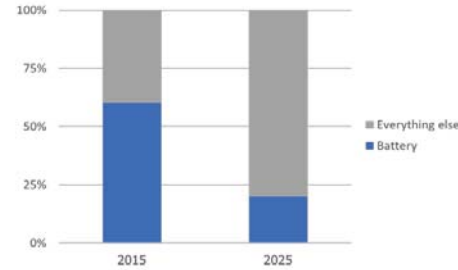
Rising production of lithium-ion battery packs has slashed prices.



Source: BloombergNEF

- From 2010 – 2018, battery prices drop by 85%
- By 2029, EV cost will **reach parity** as battery prices continue to fall (Bloomberg NEF)

EV battery cost for U.S. mid-size car as a percentage of retail price



Government Support

Worries about climate change and air pollution are prompting authorities around the world to consider phasing out new petrol and diesel engines in the coming decade

Auto makers' Investment

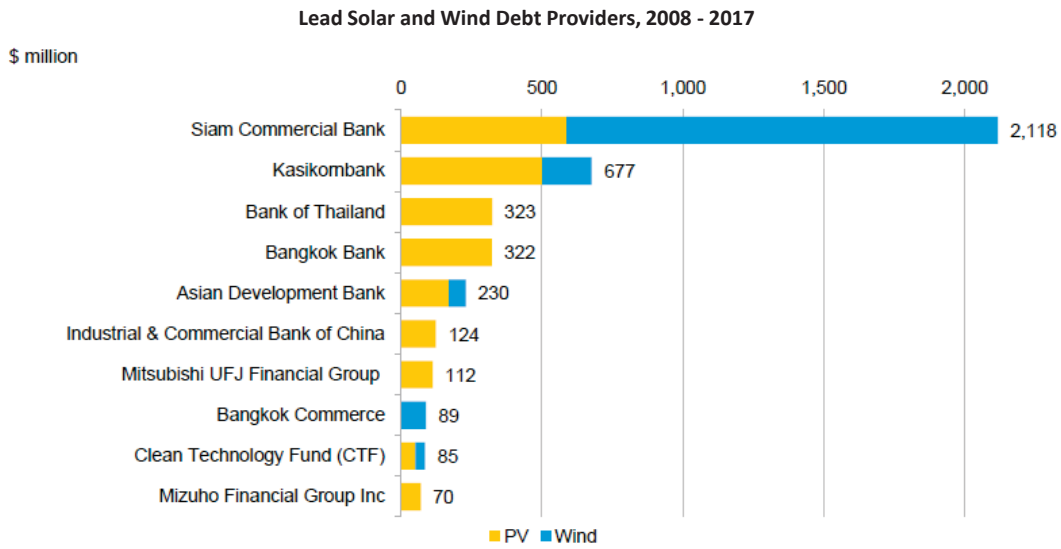
LIST OF MANUFACTURERS GRANTED BOI'S EV INCENTIVES

Hybrid EV	Plug-in hybrid EV	Battery EV	Lithium-ion battery
<ul style="list-style-type: none"> Toyota (19.02 billion baht) Nissan (10.96 billion baht) Honda (5.82 billion baht) 	<ul style="list-style-type: none"> Mercedes-Benz (607 million baht) BMW Group (705 million baht) SAIC Motor-CP (1.36 billion baht) 	<ul style="list-style-type: none"> FOMM (716 million baht) 	<ul style="list-style-type: none"> Beta Energy Solution (1.1 billion baht) Thonburi Energy Storage Manufacturing (600 million baht) Energy Absolute (2 billion baht) Global Power Synergy (1.48 billion baht)
Tentative plans from manufacturers			
<ul style="list-style-type: none"> Mazda Suzuki 	<ul style="list-style-type: none"> Mitsubishi 	<ul style="list-style-type: none"> Mine Mobility Research 	

Source: Board of Investment, compiled by Bangkok Post

Be part of the solution

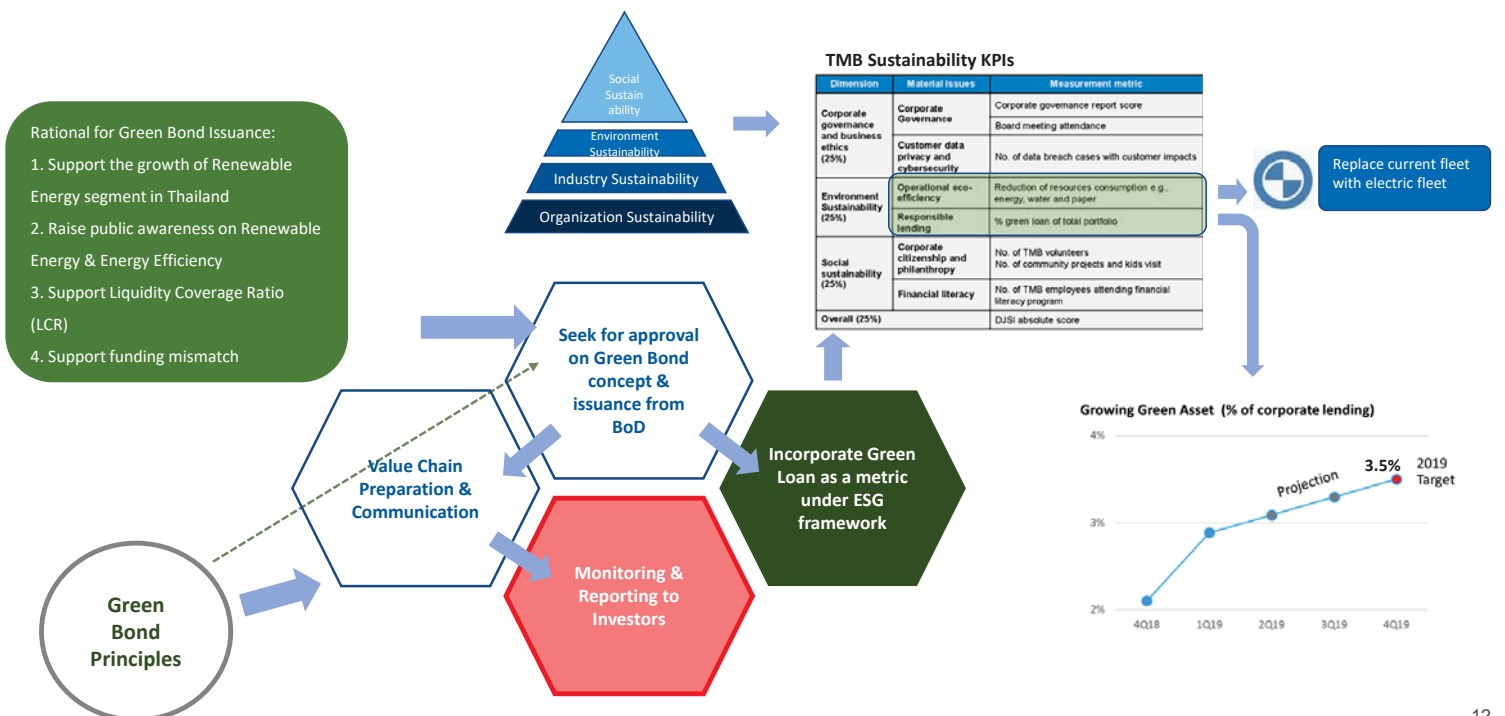
In the last decade, SCB, KBANK and Bangkok Bank are the top debt providers of solar and wind plant investment.



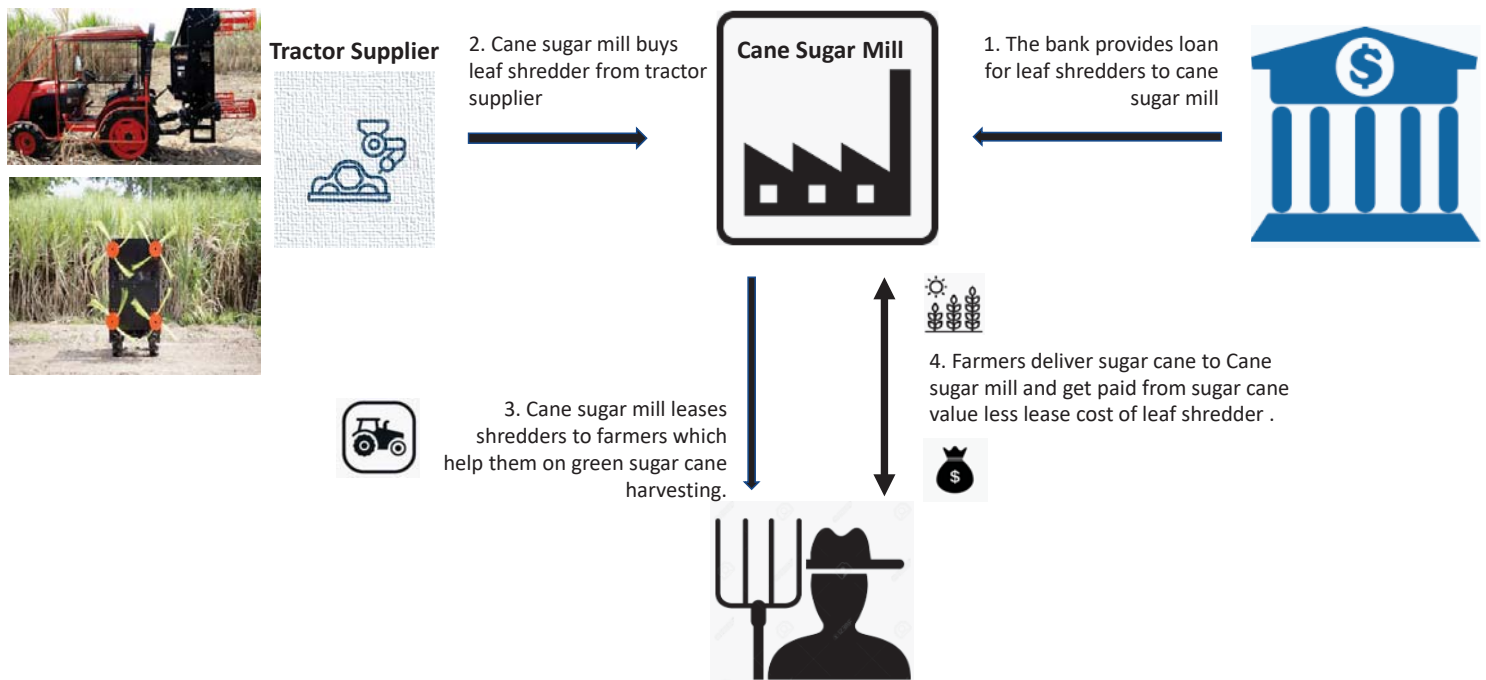
Source: BloombergNEF

- Once local banks became comfortable with PV, they can increase their exposure to solar projects
- Green Loan project supported by TMB is around USD 225 mn (Mar-19). It is expected to reach USD 500 mn by the end of 2019

The success of a Green Bond program requires adoption at the highest level and cascaded down through policies and KPIs to ensure it is embedded as BAU



Case Study: Financing Leaf Shredders



5 Factors for effective green financing

