



# Achievement in Outdoor Microalgae Oil Cultivation and R&D at TISTR AEC

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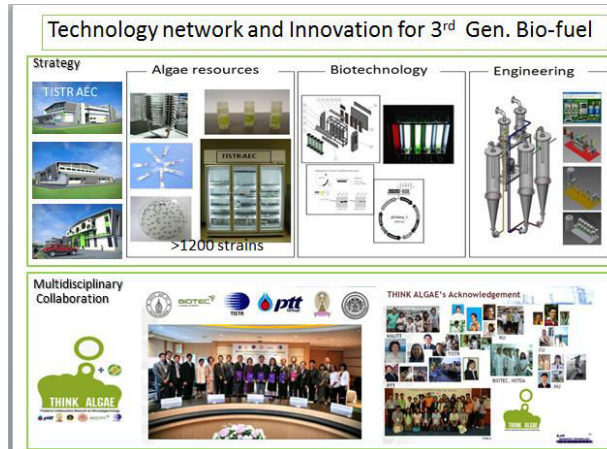
Department of Bioscience

Thailand Institute of Scientific and Technological Research (TISTR)

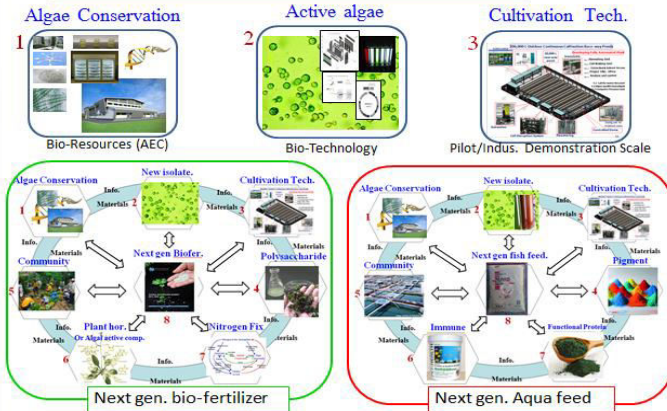


# Scope

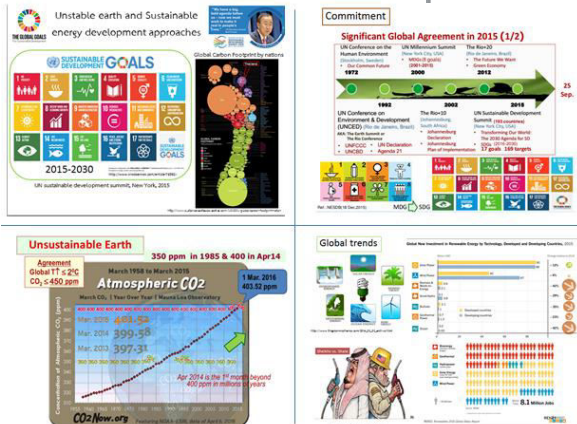
## How we work?



## Technology and Co-product Value Chains



## Why we work?



## Things we deliver?

## What we have?



## Who we are?







Training Program on Production Upgrading and Value Creation for SMEs and Micro-enterprises

31 Oct – 11 Nov 2016

Bangkok, Thailand

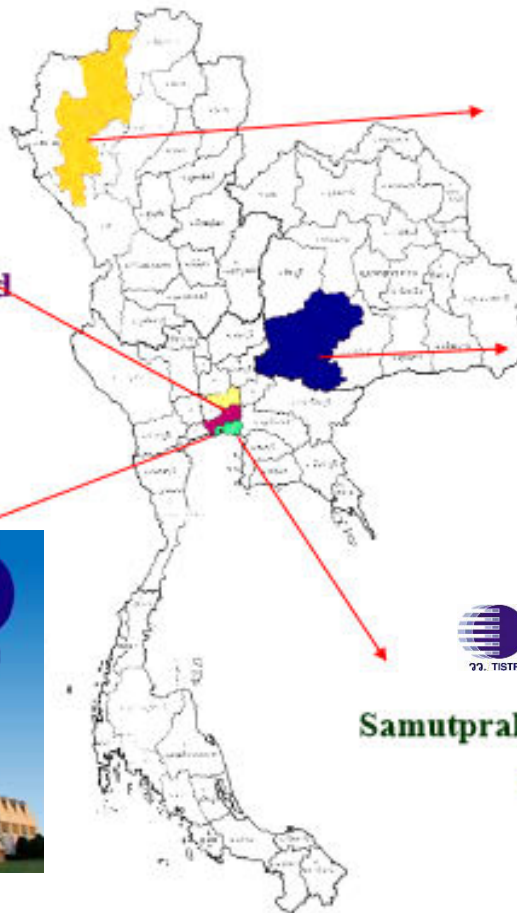
Thailand Institute of Scientific and Technological Research (TISTR)

Location



**Pathumthani**

- R & D
- Material Properties Analysis and Development Centre
- Microbes Centre (Bangkok MIRCEN, UNESCO)



**Chiangmai**

- R&D at Doi Pui



**Nakhon Ratchasima**

- Sakaerat Environment Research Station (UNESCO-Biosphere Reserve)
- Lam Takhong Research Station



**Samutprakarn**

- Industrial Metrology and Testing Service Centre



Home Ministry of Science and Technology Policy and Plan Press Releases Contacts

**Food Innopolis**  
The best of Thai food is among the best in the world.  
<http://foodinnopolis.or.th/>

**Food Innopolis at Thailand Science Park**  
A global food innovation hub at Thailand Science Park, a gateway to ASEAN



สถาบันวิจัยวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย  
Thailand Institute of Scientific and Technological Research  
กระทรวงวิทยาศาสตร์และเทคโนโลยี

หน้าแรก แผนที่ วว. วิจัยและพัฒนา บริการ ค่าตอบแทน สื่อและสิ่งพิมพ์ ผลงานความรู้ ติดต่อ

**53rd**  
วว./TISTR Anniversary

Training Program on Production Upgrading and Value Creation for SMEs and Micro-enterprises  
31 Oct – 11 Nov 2016  
Bangkok, Thailand  
Thailand Institute of Scientific and Technological Research (TISTR)

WAITRO [Logos]

วว./TISTR

**BSD**  
Bioscience Department

**ฝ่ายวิทยาศาสตร์ชีวภาพ**  
สถาบันวิจัยวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย

หน้าหลัก เกี่ยวกับฝ่าย บทความ งานวิจัย งานบริการ ติดต่อเรา ส่วนใหม่





## TISTR's Background

- Established in 1963
- Non-profit state enterprise
- Ministry of Science and Technology
- Initiate and conduct R&D and provide S&T service for industries



TISTR's Integrated R&D on Freshwater Microalgae from up-stream (ACC) to down stream (product, process, innovation)





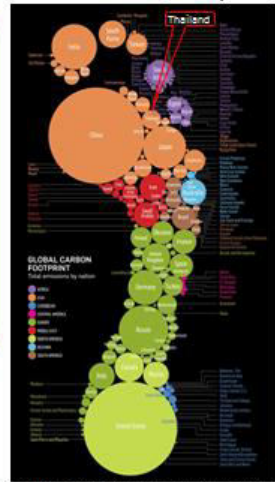


# Unstable earth and Sustainable energy development approaches



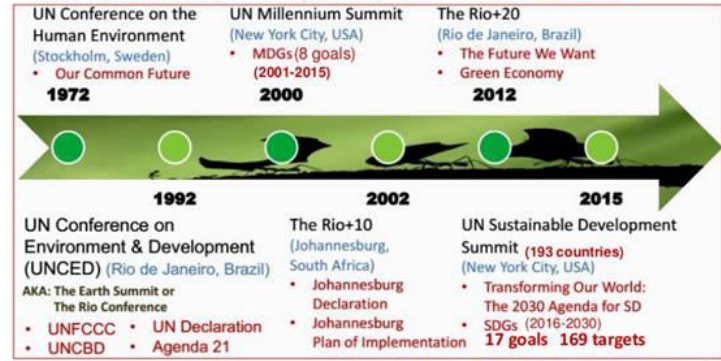
UN sustainable development summit, New York, 2015

Global Carbon Footprint by nations



# Commitment

## Significant Global Agreement in 2015 (1/2)



25 Sep.

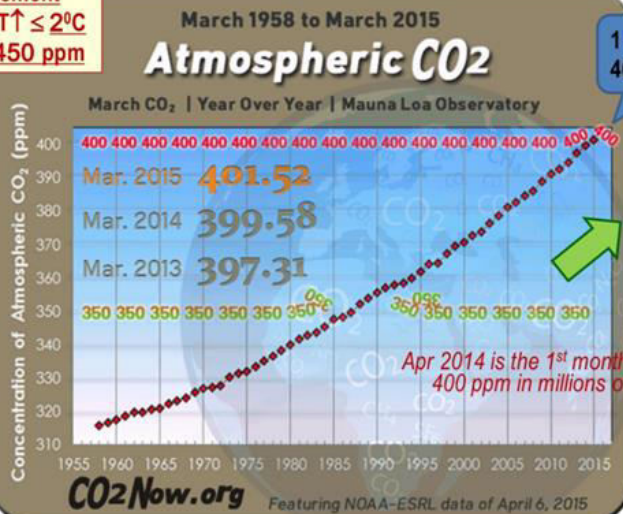


# Unsustainable Earth

Agreement  
Global T<sub>↑</sub> ≤ 2°C  
CO<sub>2</sub> ≤ 450 ppm

350 ppm in 1985 & 400 in Apr14

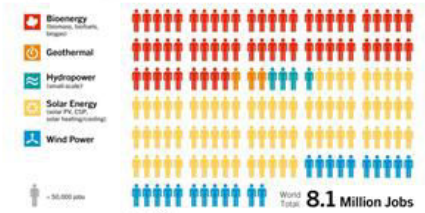
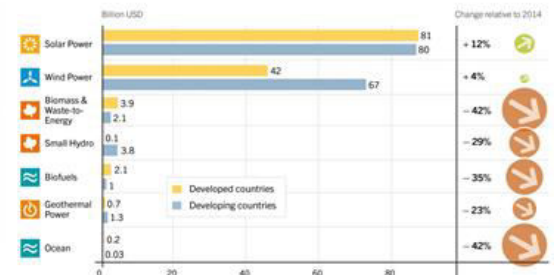
## Atmospheric CO<sub>2</sub>



# Global trends



Global New Investment in Renewable Energy by Technology, Developed and Developing Countries, 2015



http://greenenergy.blogspot.com/

REN21 Renewables 2016 Global Status Report



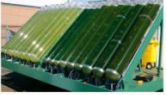



# Regional/Thailand trends

Sustainable Future through Technology and Innovation



## Biofuel Options

	Gasoline Replacers	Diesel Replacers	Alternatives
Different to Petroleum Fuels	<b>Ethanol</b> Fermentation of sugar/starch crops 	<b>FAME</b> Biodiesel made from transesterification of vegetable oils 	<b>Biogas</b> Methane created from biomass <b>Hydrogen</b> Created from bio-materials, can be used in fuel cells or ICES <b>DME</b> Produced from the dehydration of methanol. Can be used in diesel and petrol engines.
	<b>Methanol</b> Fermentation of sugar/starch crops	<b>HVO</b> Biodiesel made from hydrogenation of vegetable oils and animal fats <b>Biodiesel</b> Biodiesel from pyrolysis of Lignocellulosic material <b>BTL</b> Biodiesel created from biomass to liquid process	<b>Algae Fuel</b> SVO or transesterification into Biodiesel. Carbohydrate content fermented into ethanol and butanol 
Resemble Petroleum Fuels	<b>Butanol</b> Fermentation of sugar/starch crops 		

<http://www.torconstructionpros.com/magazine/et/issue/2015/apr>

## Technology

- Industry
- Health
- Food security
- Climate protection
- Environment protection
- Energy supply

## Economy



THINK GREEN

Department of Alternative Energy Development and Efficiency  
MINISTRY OF ENERGY

### Alternative Energy Development Plan (AEDP) 2015-2036

Foundation: Commitment to the development of a low-carbon society

Facilitator:  
Private-led investment

Strategy: Alternative Energy Development Plan 2015-2036

Facilitator:  
Government funded RD&D

Goal: Target 30% renewables in Total Energy Consumption by 2036

Bio-Energy			Bio-Fuel		
Biomass	Biogas	MSW + Industrial Waste	Ethanol	Biodiesel	Pyrolysis Oil
5,570 MW	1,280 MW	550 MW	11.3 ML/Day	14 ML/Day	0.53 ML/Day
22,100 ktoe	1,283 ktoe	495 ktoe			
6,720 MW Power   23,878 Ktoe Heat			CBG	Alt. Fuels*	
			4,800 t/Day	10 ktoe	
Solar	Wind	Hydro		New-Energy	
6,000 MW	3,002 MW	Large Hydro	Small Hydro	Geothermal, Used Tire Oil, etc.	
1,200 Ktoe		2,906.40 MW	376 MW	10 ktoe	
9,002 MW Power   1,200 Ktoe Heat		3,282.40 MW			

\* Alternative fuels = Bio-oil, Hydrogen

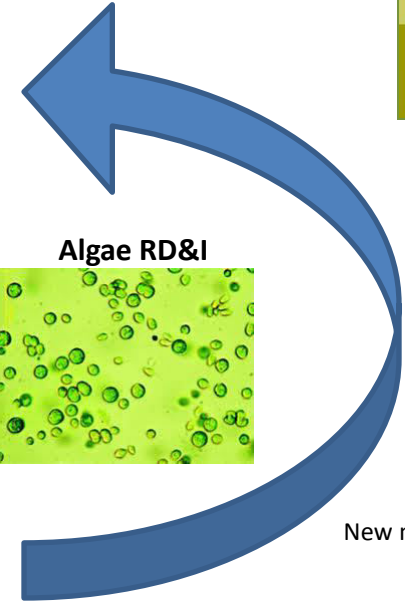
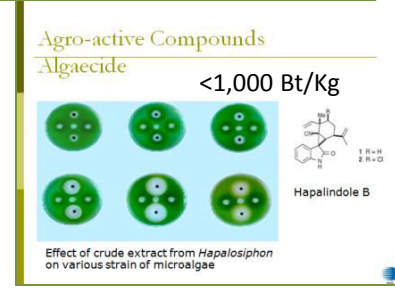
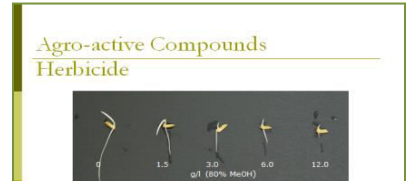
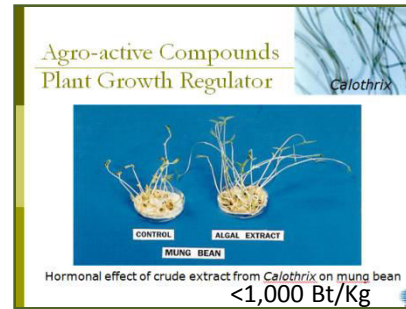
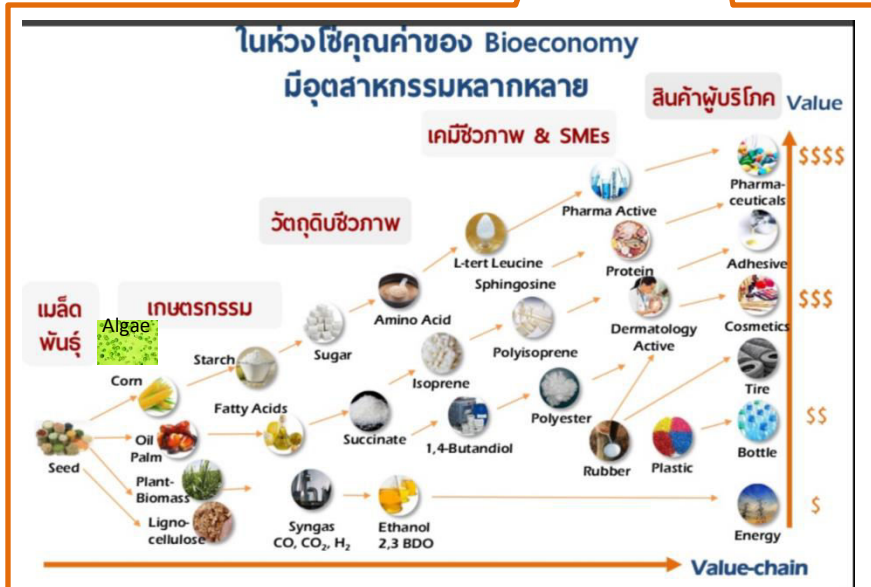
## Policy (AEDP 2015-2036)



# Algae Technology ,Thailand Super cluster and Bioeconomy



[https://twitter.com/oie\\_news](https://twitter.com/oie_news)



Protein  
30-40 Bt/kg ( crude)/300-4,000 Bt/kg





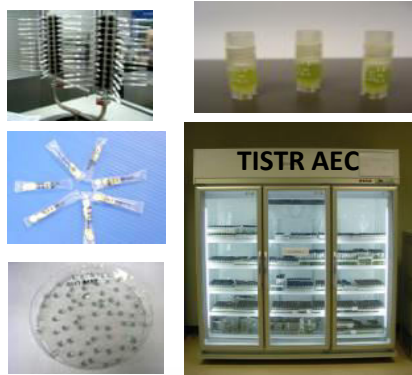
# TISTR Algal Excellent Center (TISTR AEC)

Vision: To be the excellent center in regional recognition

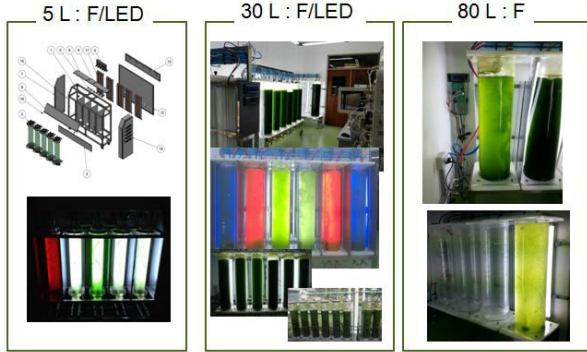
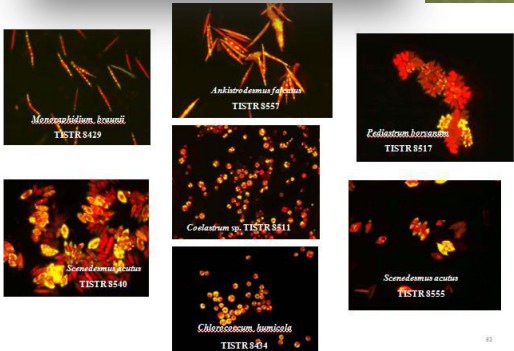
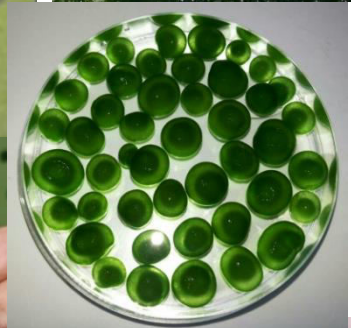
Total Budget: 250 MB (~8.0 MUSD)

TISTR ACC / TISTR Algal Research Resources Center (TISTR ARRC)

Freshwater & marine microalgal researches and utilizations



New research facilities







# TISTR AEC



2012-2016  
TISTR AEC

Product/Process innovation



2015-2016



**TISTR Algal Excellent Center (TISTR AEC)**  
 Vision: To be the excellent center in regional recognition  
 Duration: 5 years (2013-2017)  
 Total Budget: 250 MB (~8.0 MUSD)  
 2013-14 allocated budget: 60 MB (~1.87 MUSD)(building construction)  
 TISTRACC TISTR Algal Research Resources Center (TISTR ARRC)  
 Freshwater & marine microalgal strains



2004-2010

## Technology Transfer & Service

<p><b>Biofertilizer (N<sub>2</sub>-fixing)</b></p>  <p>Heterocyst N<sub>2</sub>-fixing cells</p>	<p><b>Soil conditioner (polysaccharide-producing)</b></p> 
<p><b>Food (edible <i>Nostoc</i> ball)</b></p> 	<p><b>Testing service</b>        Thai Industrial Standard TIS 2321-2549        "Weather Resistant Emulsion Paints"</p> 

1995

## Algae Culture collection and R&D



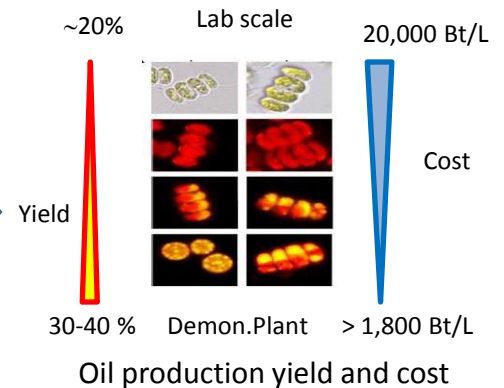
2011-2015

## THINK ALGAE



Fresh and Marine algae

Result





# Technology network and Innovation for 3<sup>rd</sup> Gen. Bio-fuel

## Strategy

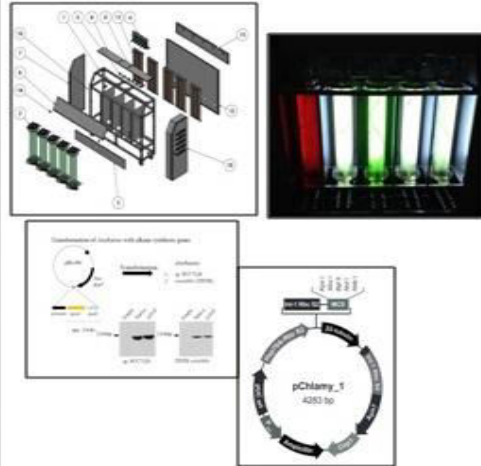


## Algae resources

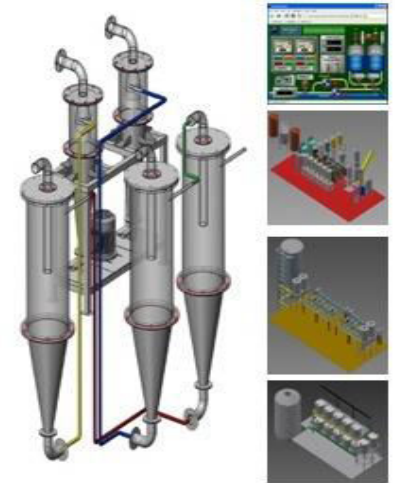


>1200 strains

## Biotechnology



## Engineering



## Multidisciplinary Collaboration



## THINK ALGAE's Acknowledgement

