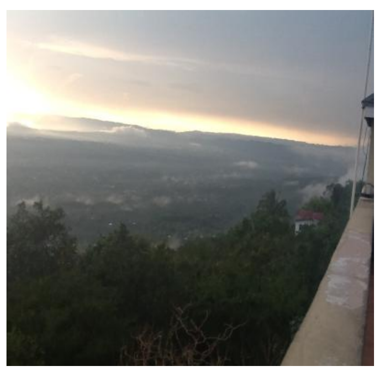






An Introduction to Climate Smart Agriculture

Presented by:
Aidan J. Rogers
Attorney-at-Law

Vybzing Youth Booth Camp, Grenada 23rd to 25th May 2018

TOPICS TO BE DISCUSSED

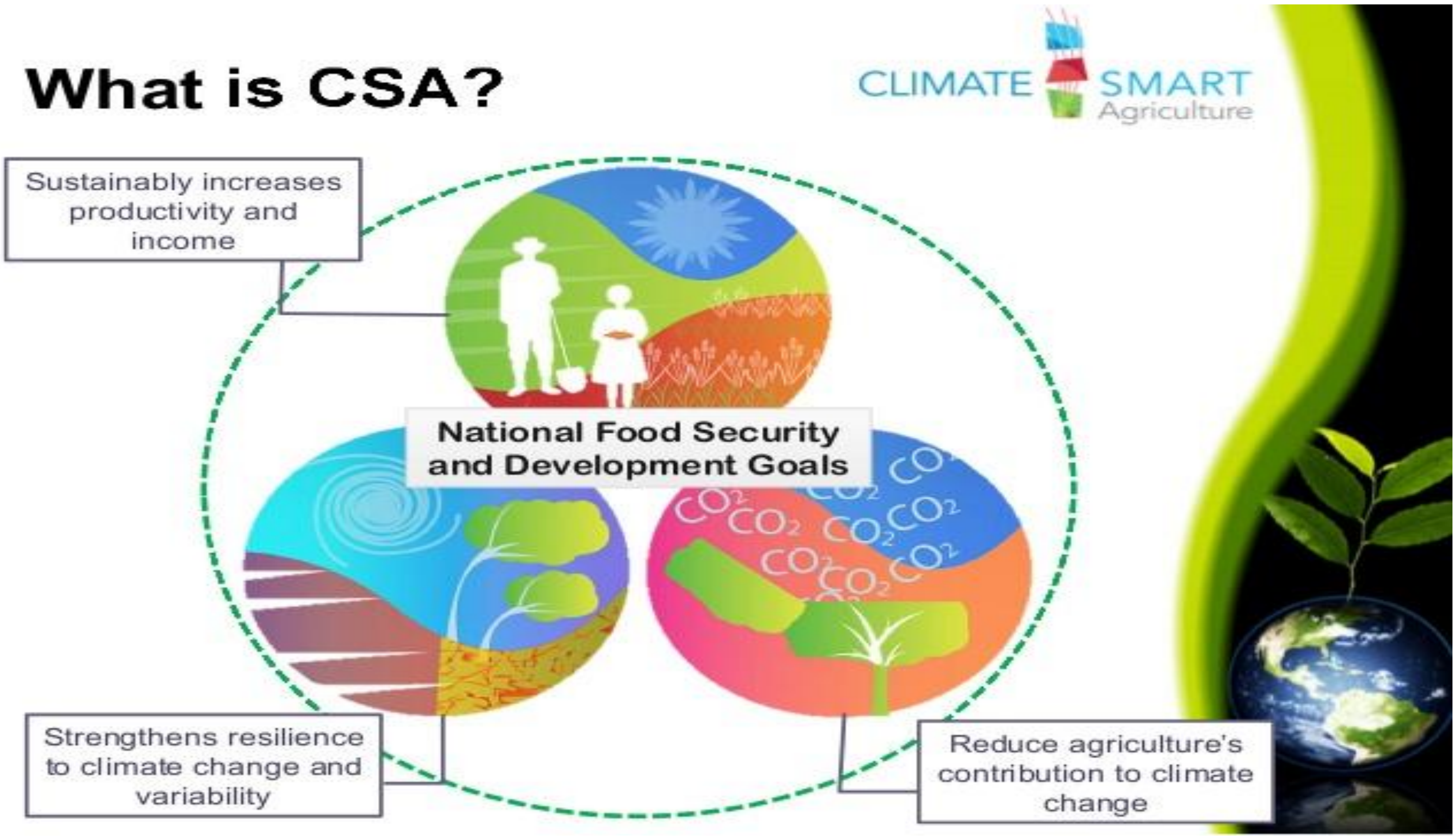
1) Definition of Climate Smart Agriculture (CSA)
2) Climate Change and CSA
3) CSA Policies and Trends
4) CSA Practices
5) Protected Agriculture as a response to CSA
6) Renewable Energy and CSA
7) Regional Scenario
8) CSA and Sustainable Energy
9) Overview of Renewable Energy Technologies

Definition of Climate Smart Agriculture (CSA)

- **"…an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate."**

- Food and Agriculture Organization of the United Nations

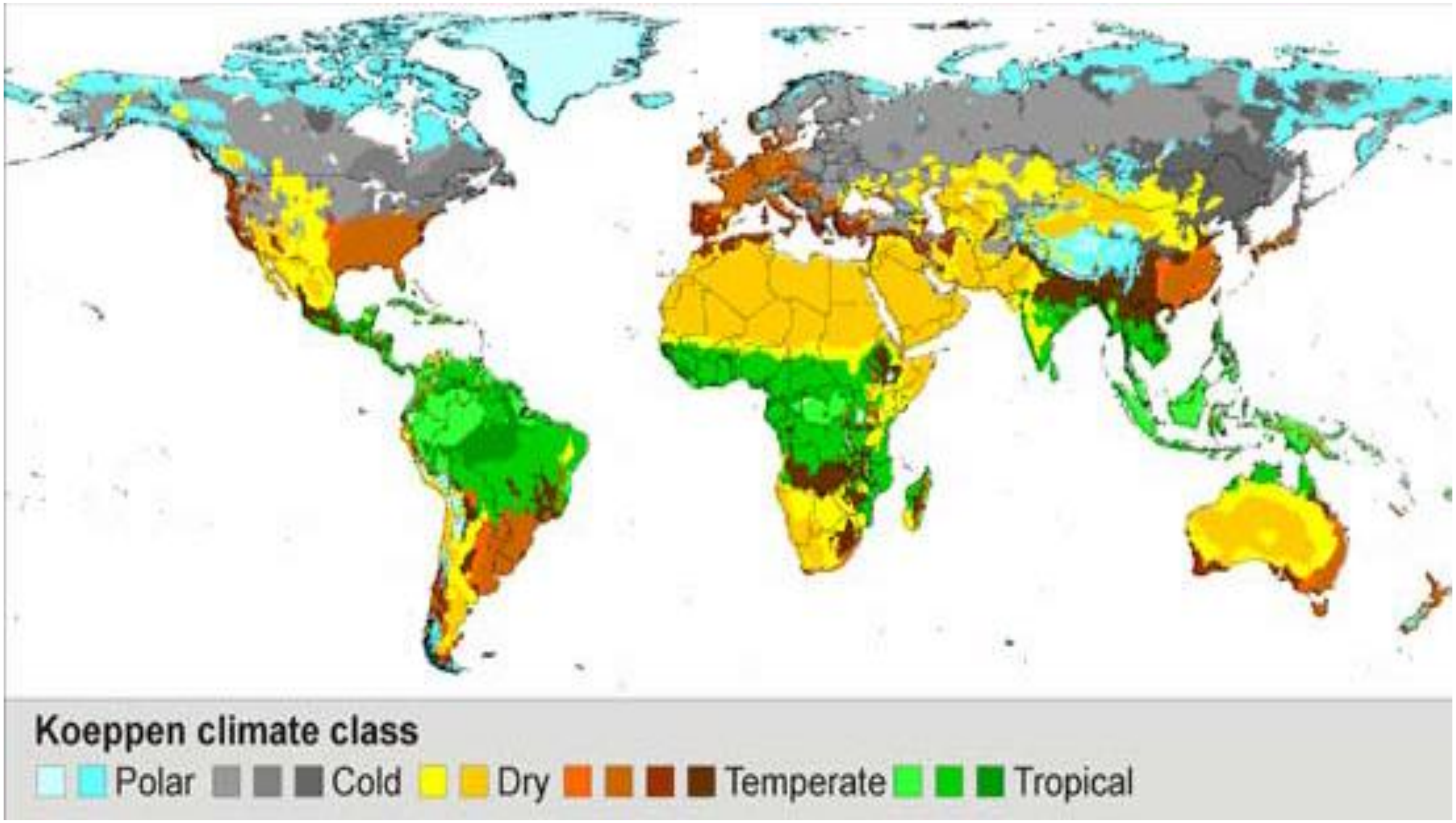
Source : Irina Papuso and Jimly Faraby.



3 Objectives of CSA

- sustainably increasing agricultural productivity and incomes;
- adapting and building resilience to climate change;
- and reducing and/or removing greenhouse gas emissions, where possible.

Global Climate Profile



Effects of Climate Change

- Extended duration of droughts
- Increased intensity of climate events and hurricanes
- Variable rainfall amounts
- Sea level rise and salt water intrusion into onshore water supplies
- Temperature increases

Global CSA Policy Trends

- Coordination and integration between various sectors dealing with climate change, agricultural development and food security at national, regional and local level is a key requirement for creating an enabling policy environment
- Climate-smart agriculture needs to be mainstreamed into core government policy, expenditure and planning frameworks. To be effective CSA policies must contribute to broader economic growth, poverty reduction and sustainable development goals. They must also be integrated with disaster risk management strategies, actions, and social safety net programmes.
- Providing incentives for adopting CSA, such as payments for environmental services (managing land to provide an ecological service), encourages farmers to take on climate-smart practices and to overcome initial investment barriers.

CSA Practices

- Integrated Practices
- Crop Production
- Livestock
- Forestry
- Urban and peri-urban farming
- Genetic Biodiversity
- Fisheries and aquaculture
- Land and water management
- Proactive Drought Management
- Energy
- Food Loss and waste
- Nuclear Techniques

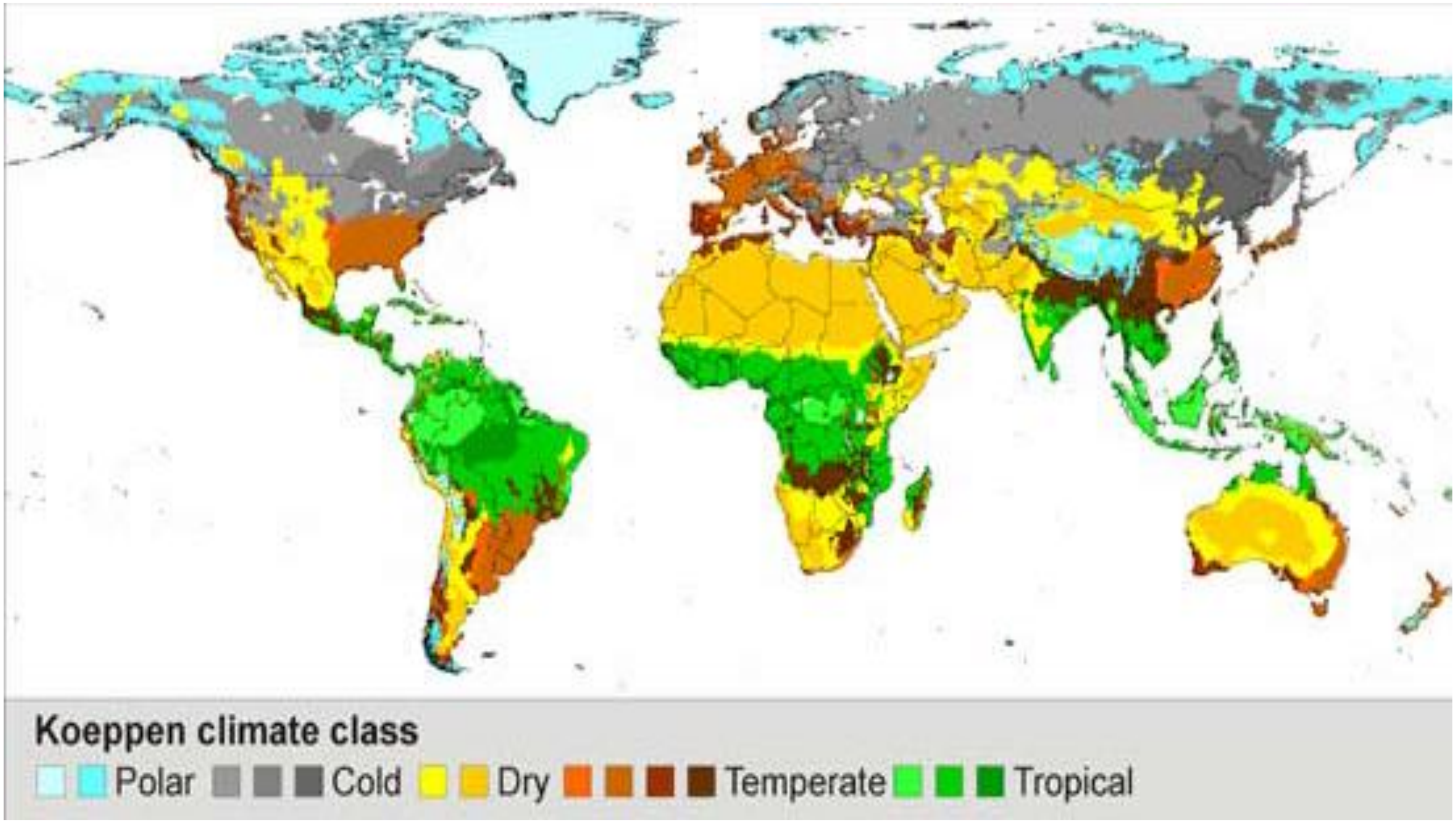
Drivers of Adoption of Protected Agriculture (PA) Systems

- Heavy Importation of fresh fruits and vegetables
- Challenges with supply and demand - Seasonality of crops
- Difficulty in accessing capital financing
- High Input costs- utilities, machinery, agro-chemicals

Protected Agriculture

- What is protected agriculture?
  - *A structure used to enclose a set area of crops, vegetables or flowers to protect them from the elements.*
- What is the difference between protected and unprotected agriculture?
  - *Helps provide protection from the elements*
  - *Adds a level of security from thieves & pests*

Global Climate Profile



Protected Agriculture

Photo of Shelly Ginger Farm in Jamaica 2013

Example of Protected Agriculture Structures

Photo of Adams Farm in Jamaica 2013

Protected Agriculture Structures

http://www.greenhatters.com/blog/wp-content/uploads/2014/01/Greenhouse_at_Wilson_Farm_East_Lexington_MA.jpg

Benefits of PA

- three-fold increases in yields over open field cultivation
- Six-fold increases in yields when combined with hydroponics
- Protection from climate and environmental threats
- Predictability of supply

Challenges with PA in the Region

- High Temperatures
- High Relative Humidity

Challenges with PA

- *"Healthy plants can transpire a lot of water, resulting in an increase in the humidity of the greenhouse air. A high relative humidity (above 80-85%) should be avoided because it can increase the incidence of disease and reduce plant transpiration. Sufficient venting, or successively heating and venting can prevent condensation on crop surfaces and the greenhouse structure. The use of cooling systems (e.g., pad-and-fan or fog) during the warmer summer months increases the greenhouse air humidity. During periods with warm and humid outdoor conditions, humidity control inside the greenhouse can be a challenge. Greenhouses located in dry, dessert environments benefit greatly from evaporative cooling systems because large amounts of water can be evaporated into the incoming air, resulting in significant temperature drops."*
- A.J. Both of Rutgers University Bio-resource Engineering Department of Plant Biology and Pathology

Regional PA Climate Zones

- *Although there are many greenhouse structural designs to select from, choice of design is dependent on the environment where the greenhouse is to be situated. In the Caribbean, two distinct zones can be defined:*

Climate Zone 1

- ***Cool high-level elevations above 500m above sea level with average daytime temperatures for most of the year less than 28°C e.g. high areas of Jamaica, Haiti and the Dominican Republic. It should be noted that during the cold winter months in the northern hemisphere, cold fronts move southward and cause lower temperatures (as low as 12°C) in these islands.***

Climate Zone 2

- ***Sea level/low elevation hot humid environments below 500m above sea level with average yearly daytime temperatures above 28°C e.g. Lesser Antilles.***

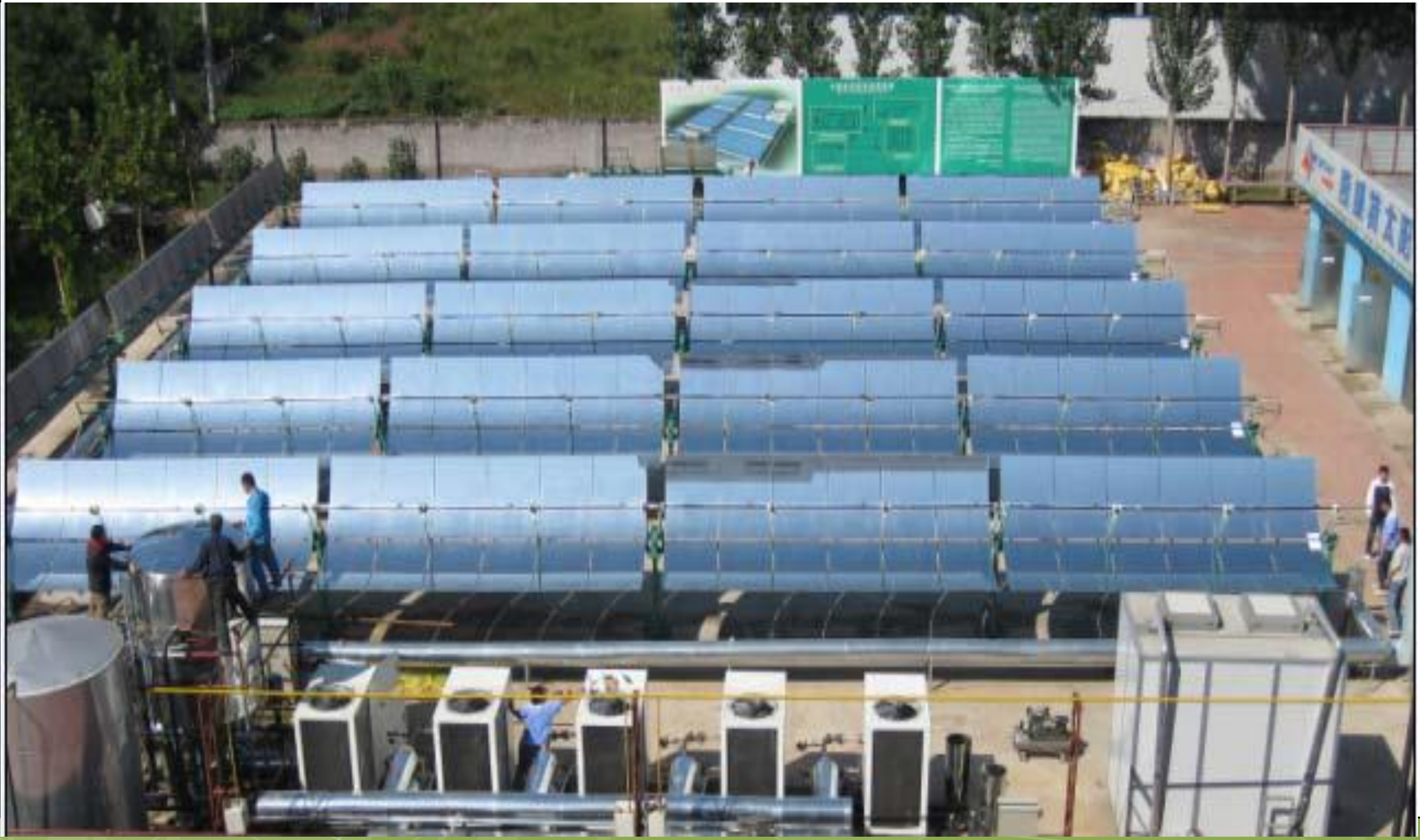
Cooling Technologies

- Passage Ventilation
- Forced Ventilation systems

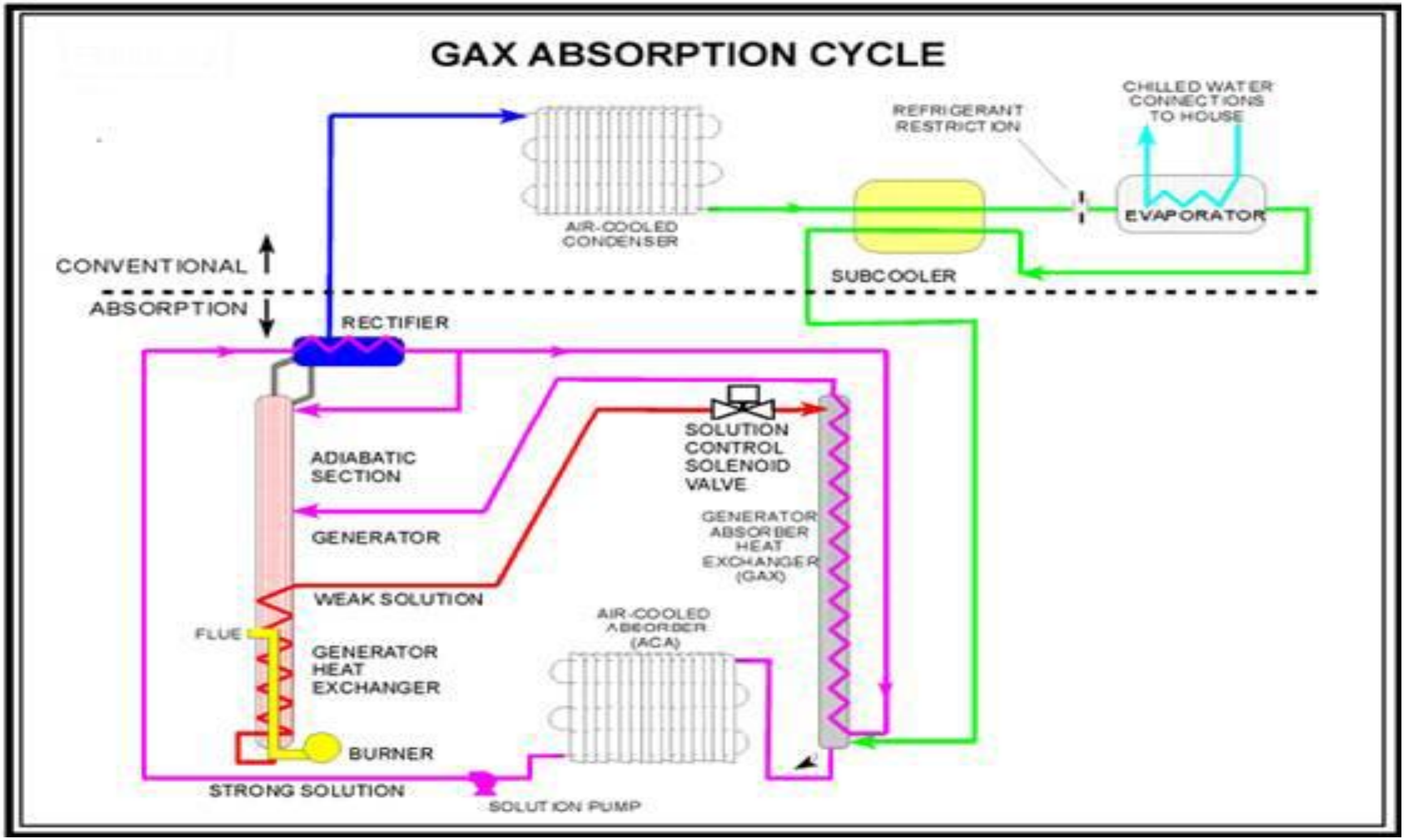
Cooling Technologies

Cooling Technologies

Cooling Technologies



Cooling Technologies



Drivers of Sustainable Energy Adoption in Agriculture

- High energy prices in the recent past has driven the incorporation of renewable energy within food production, fishing systems and agro-processing.

- Climate Smart Agriculture and the greening of the agriculture through the use of renewable agriculture has been identified as part of the NDCs for many Caribbean Countries and a part of CARICOM's Energy Policy.

- Production systems such as Permaculture & Organic Agriculture have been used to demonstrate the feasibility of a transition to a closed production systems with low energy inputs.

What is Sustainable Energy ?

"…the provision of energy such that it meets the needs of the present without compromising the ability of future generations to meet their own needs."

Three of Components of SE:

- Energy Conservation
- Energy Efficiency
- Renewable Energy

What is Renewable Energy ?

Any naturally occurring, theoretically inexhaustible source of energy, as biomass, solar, wind, tidal, wave, and hydroelectric power, that is not derived from fossil or nuclear fuel.

Types of Renewable Energy

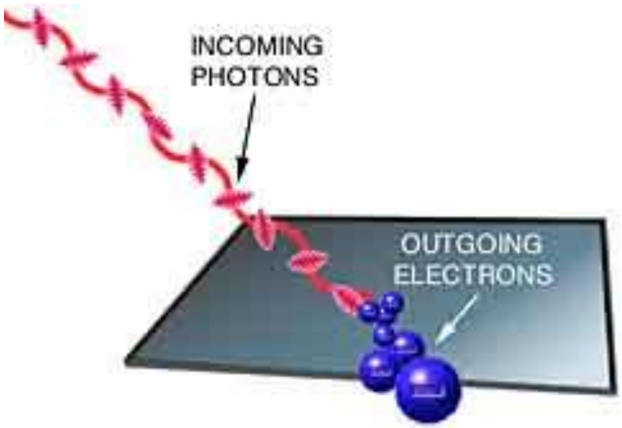
- Solar/Photovoltaic Energy
- Wind Energy
- Biomass and Bio Energy
- **Hydro, Wave and OTEC**
- Geothermal Energy

Photovoltaic Effect

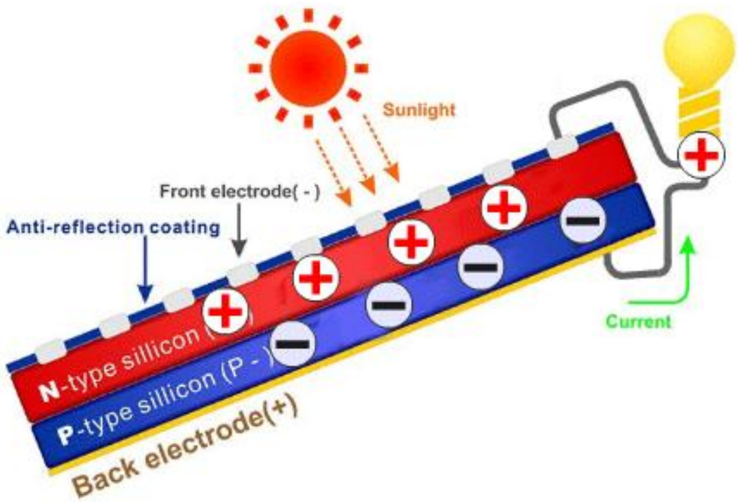
- Discovered by A.E. Becquerel in 1839
- Further Studied by other notable scientist; Einstein, Heinrich Hertz, J.J. Thompson

Photoelectric Effect

- The photoelectric effect refers to the **emission, or ejection, of electrons from the surface of a material, generally, a metal** in response to incident light.

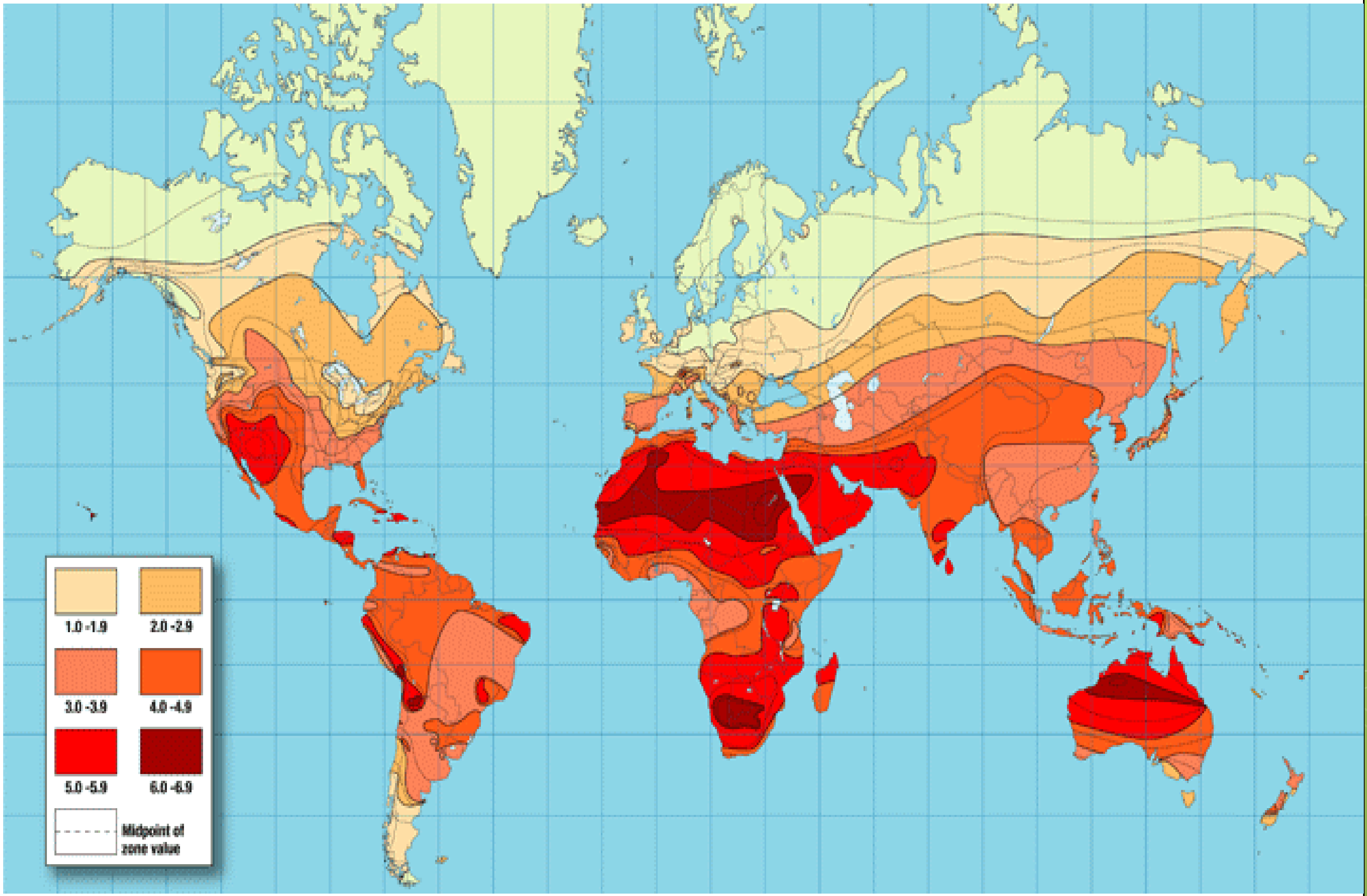


Photovoltaics Today

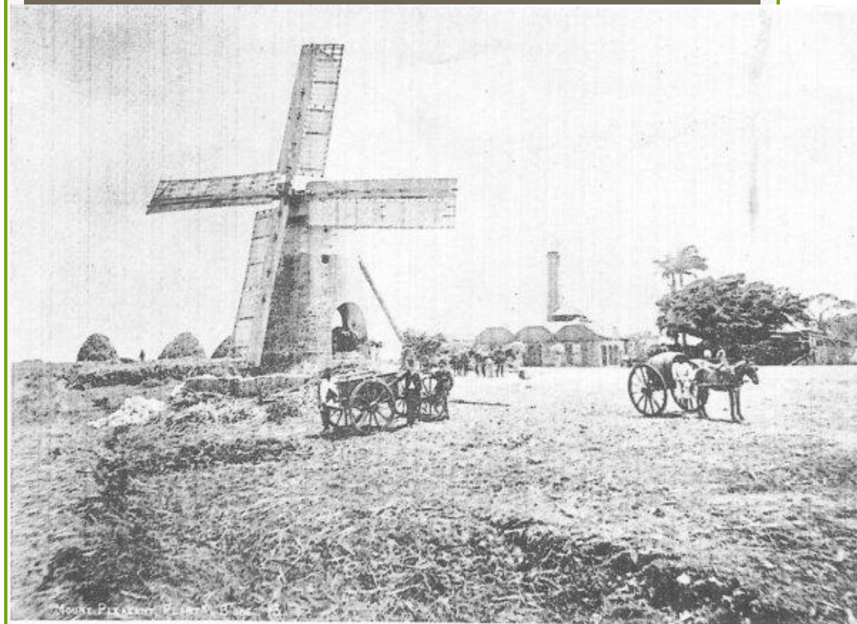


- The **photovoltaic effect** is the creation of voltage or electric current in a material upon exposure to light.

Global Solar Resource



- Extensive use of Wind Energy for grinding cane Sugar Industry
- Widespread use of Animal Dung as fertilizer to combat soil exhaustion during early 1700,'s
- Use of bagasse as fuel source to run furnaces and boilers

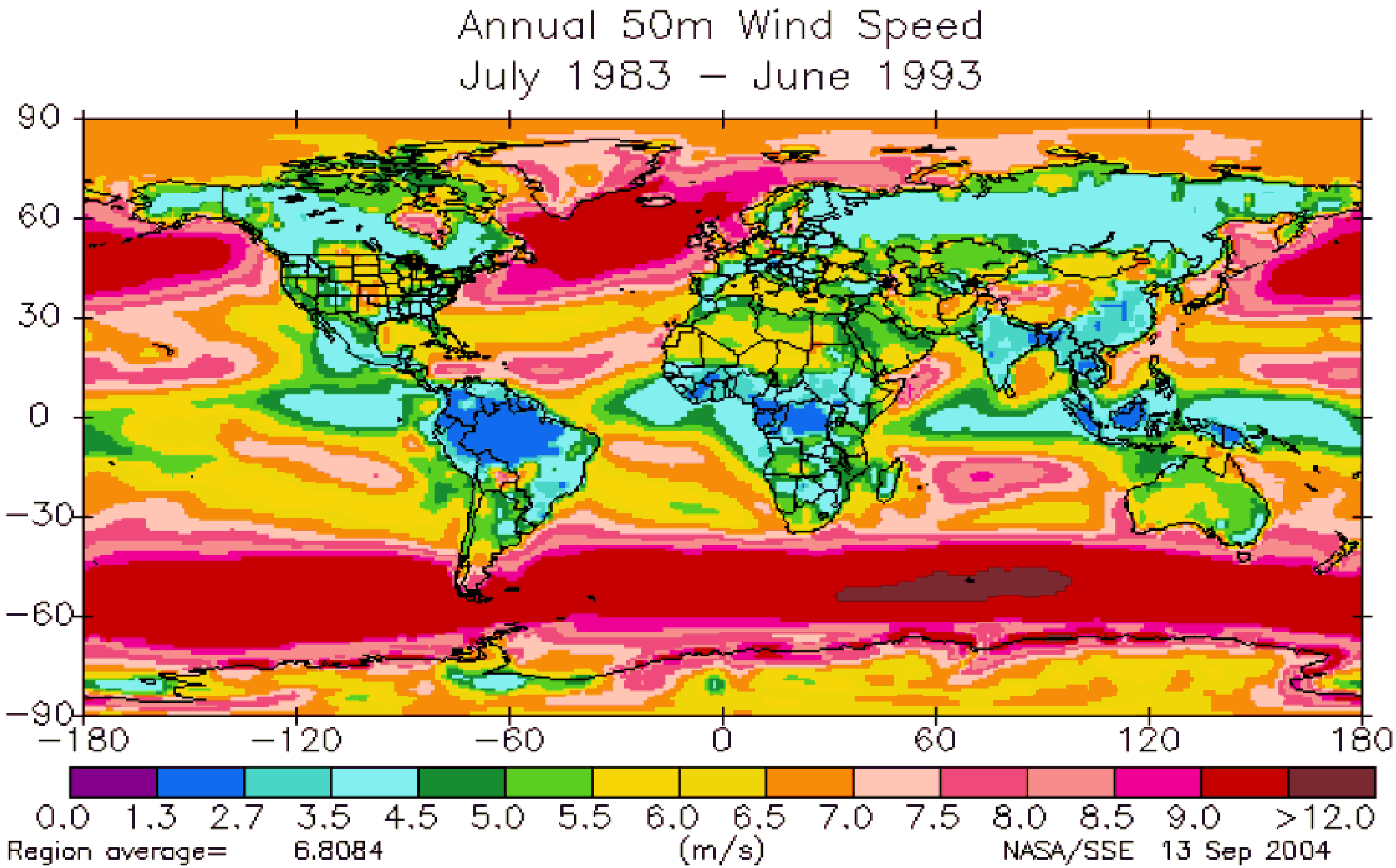


Mount Pleasant Plantation.

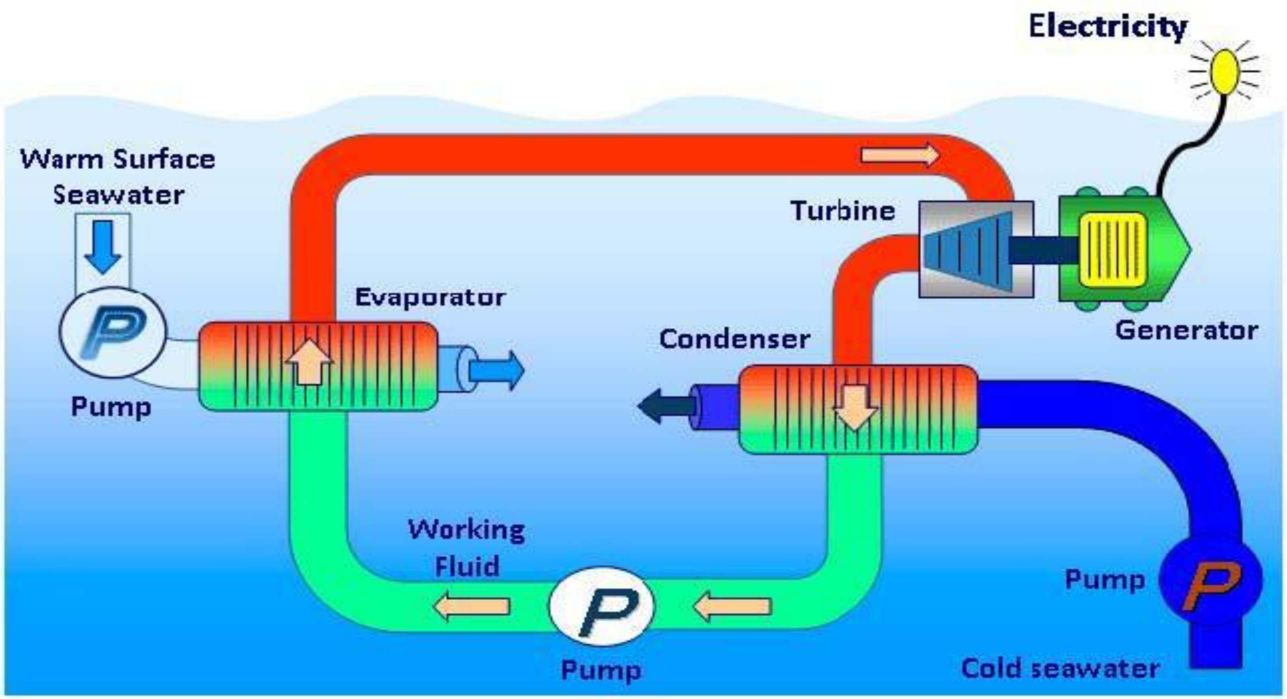
506 windmills on the island in 1846 , then ranked 2nd behind Holland with highest number per capita globally .

7 -1500kW -GE Turbines, Hagerman, Idaho

GLOBAL WIND RESOURCE

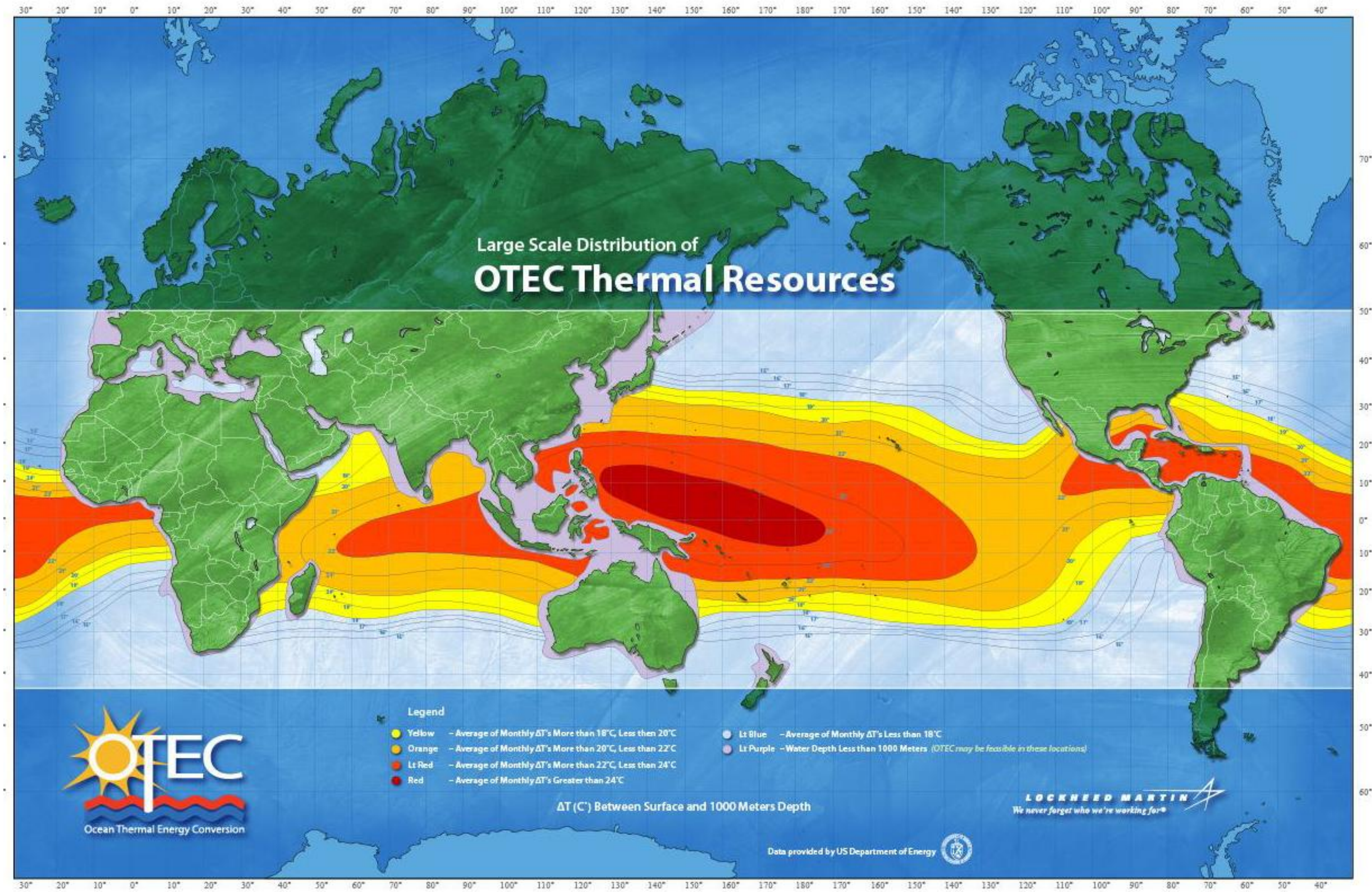


Ocean Thermal Energy Conversion (OTEC)



1. Warm seawater and Cold seawater are pumped to the evaporator and condenser.
2. The cold working fluid is pumped to the evaporator
3. The evaporator uses the warm sea water to vaporise the working fluid
4. The vapor rotates the turbine thereby generating electricity
5. The vapor then enters the condenser where the cold seawater cools it to a fluid
6. The fluid returns to the pump and the cycle is repeated

Map courtesy of Lockheed Martin Corporation



Rainwater Harvesting

Rainwater Harvesting

Rainwater Harvesting

THANK YOU