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CO2 Sequestration by Rangeland in Mongolia

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- Future Research Plan
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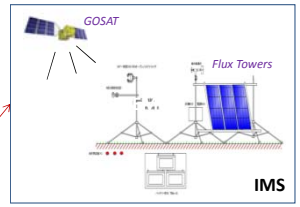
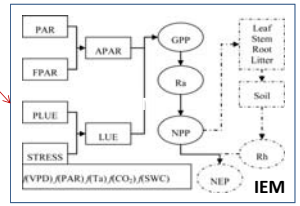
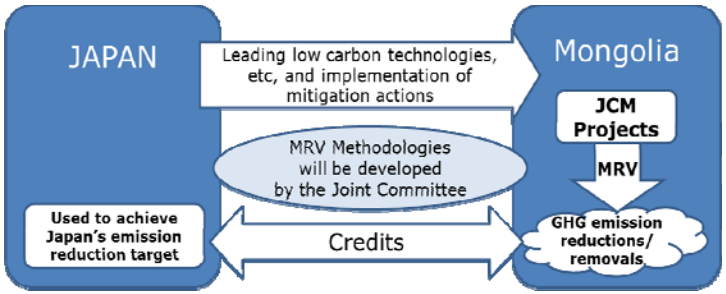
  - Permafrost degradation vs. CO2 sequestration
  - Overgrazing vs. CO2 sequestration





Background & Objectives

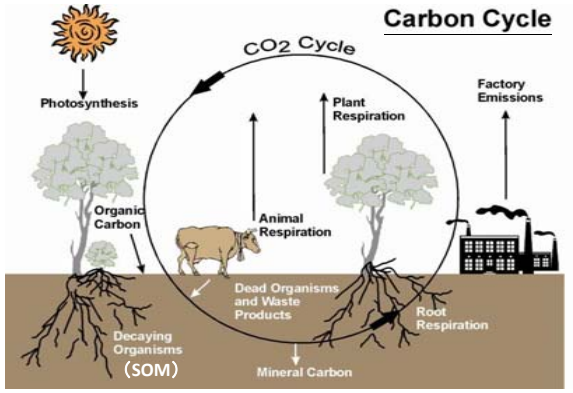
Mongolia and Japan signed a bilateral document for the introduction of the Joint Credit Mechanism (JCM) on January 8th, 2013.



- The JCM facilitates the diffusion of leading low carbon technologies, products, systems, services, and infrastructure as well as the implementation of mitigation actions, and contributing to sustainable development of Mongolia.
- It can be used to achieve Japan's GHGs emission reduction target by applying Measurement, Reporting and Verification (MRV) methodologies.

Reference: https://www.jcm.go.jp/mn-jp/about

Background & Objectives

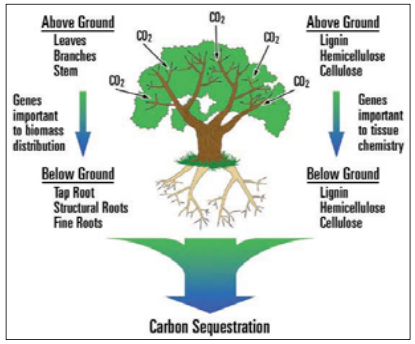


https://carbonpilgrim.wordpress.com/author/carbonpilgrim/page/8/

- Currently, the burning of fossil fuels is the major source of CO2 into the atmosphere.
- CO2 is absorbed from the atmosphere by plants, and converted to carbohydrates by photosynthesis. Carbon is then passed into the food chain and returned to the atmosphere by the respiration and decay of animals, plants, and other organisms.

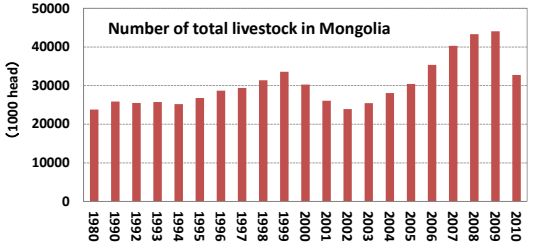
Background & Objectives

- Carbon sequestration refers to the capacity of vegetation to remove CO2 from the atmosphere through photosynthesis and stored as carbon in biomass and soil organic matter (SOM).
- Forests and stable grasslands are referred to as carbon sinks, and soils are the largest terrestrial sink of CO2, which is influenced by both natural and human disturbances, such as the addition of carbon from dead plants and carbon losses from respiration, decomposition and soil erosion.
- CO2 sequestration by rangeland depends on several factors, such as climate change, soil type, vegetation cover and grazing practices.

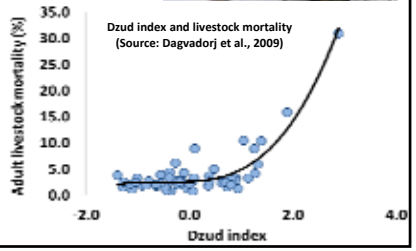


Objectives: To evaluate how much amount of CO2 will be removed or sequestrated by rangelands in Mongolia from emissions of energy application sectors, and contribute to JCM between Mongolia and Japan.

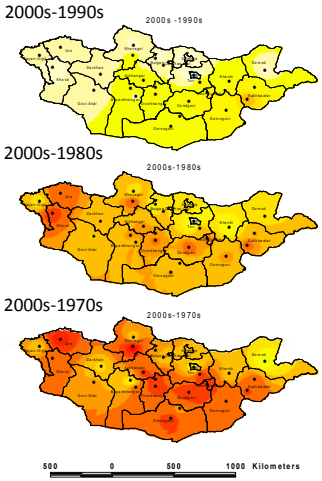
Climate Change & its Impacts

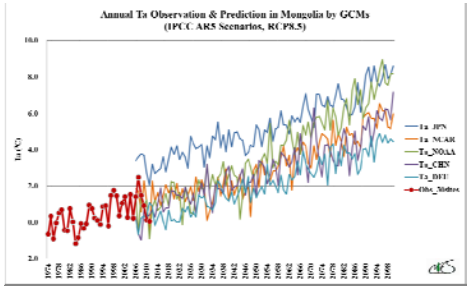


Mongolia is one of the countries very much vulnerable to climate change, because a significant part of the country's population depends on climate-dependent sectors, especially on pastoral livestock husbandry.



Climate Change & its Impacts

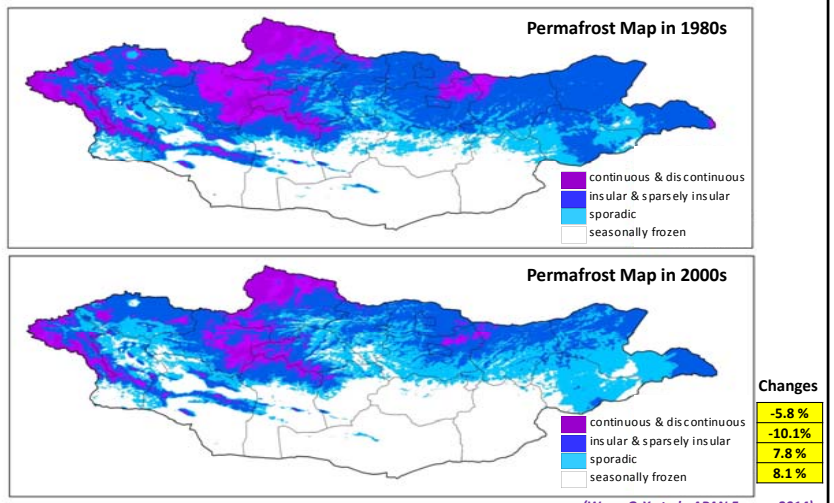




(Wang Q-X et al., APAN Forum, 2014)

During the last century, global air temperature (Ta) has increased by about 0.74°C (IPCC, 2007), but it has increased by 2.1°C since 1940 in Mongolia. It was projected to be rising about 4.1°C with IPCC AR5 Scenarios: RCP8.5 by the year of 2100.

Climate Change & its Impacts



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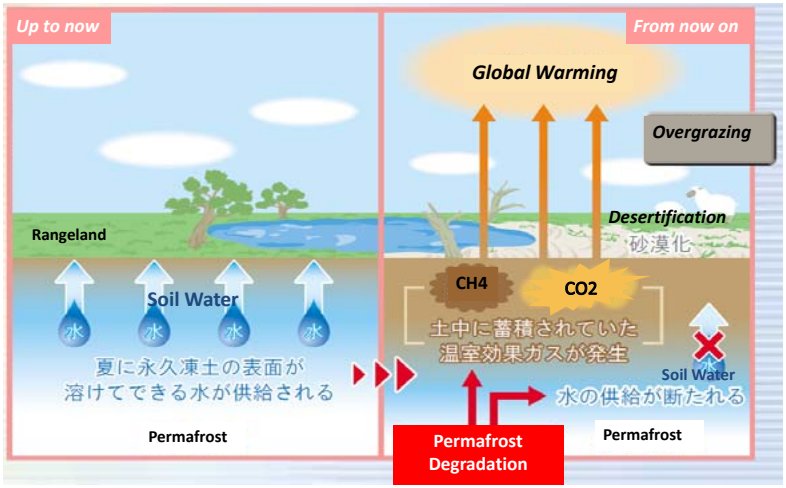
Climate Change & its Impacts

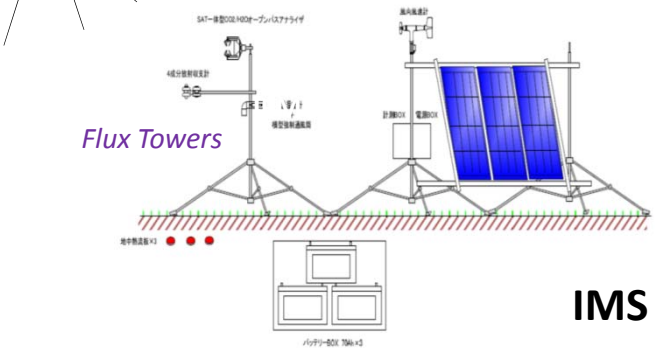


(Wang Q-X et al., APAN Forum, 2014)

Monitoring of CO2 Sequestration

GOSAT

Integrated Monitoring Systems (IMS)
for Water, Heat and CO2 Fluxes



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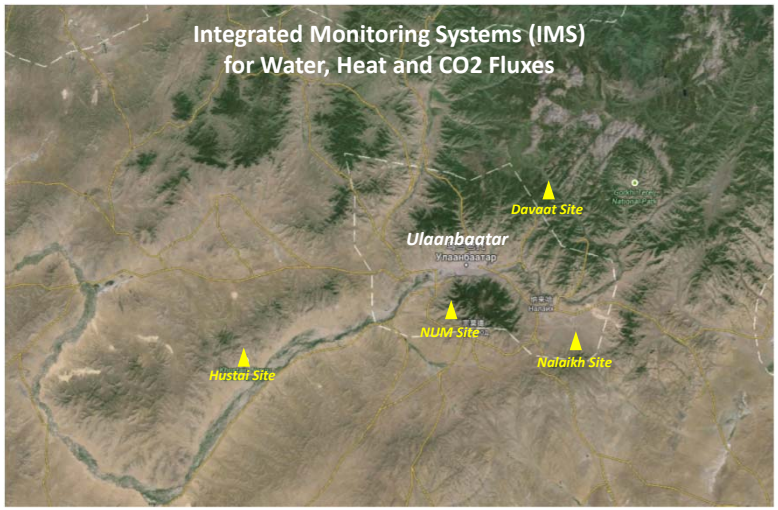

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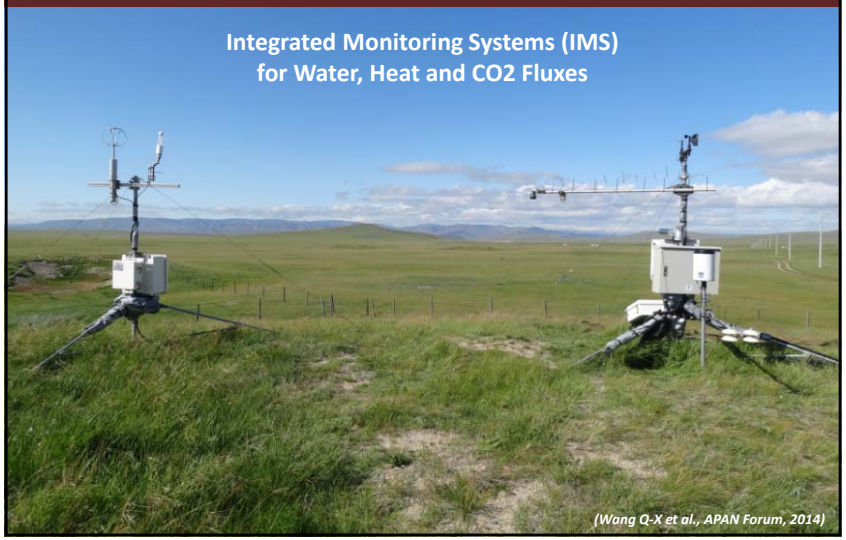

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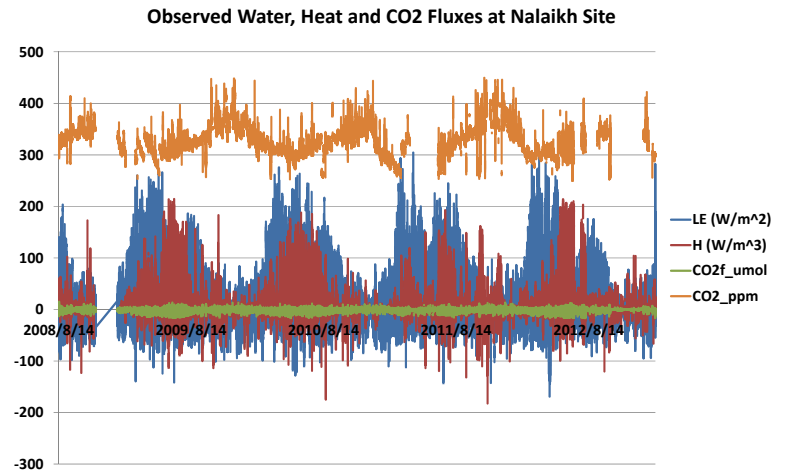

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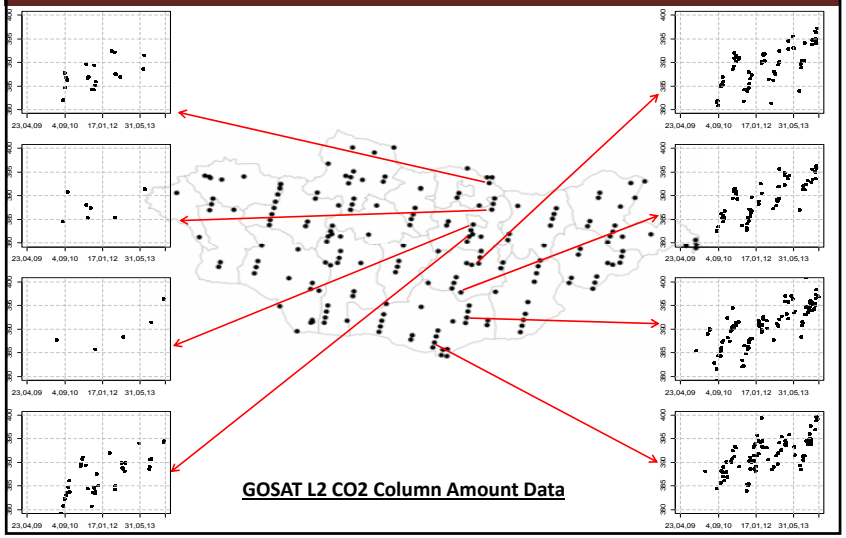
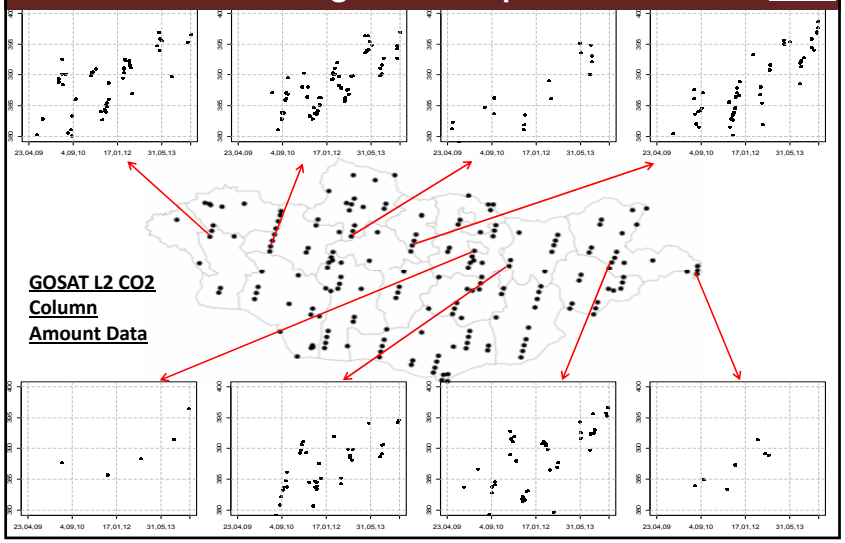


GOSAT L2 CO2 Column Amount Data

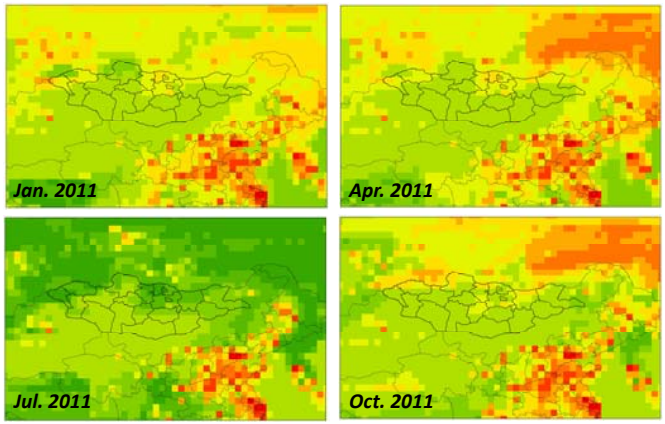
Monitoring of CO2 Sequestration



GOSAT L2 CO2 Column Amount Data

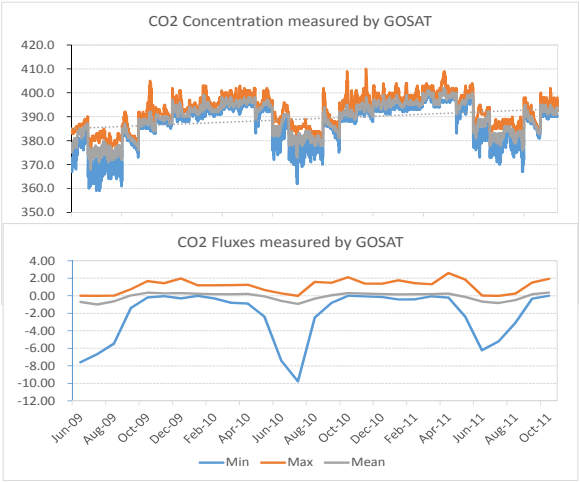
Monitoring of CO2 Sequestration

GOSAT L3 Monthly CO2 column-averaged volume in 2.5° X 2.5° mesh around Mongolia

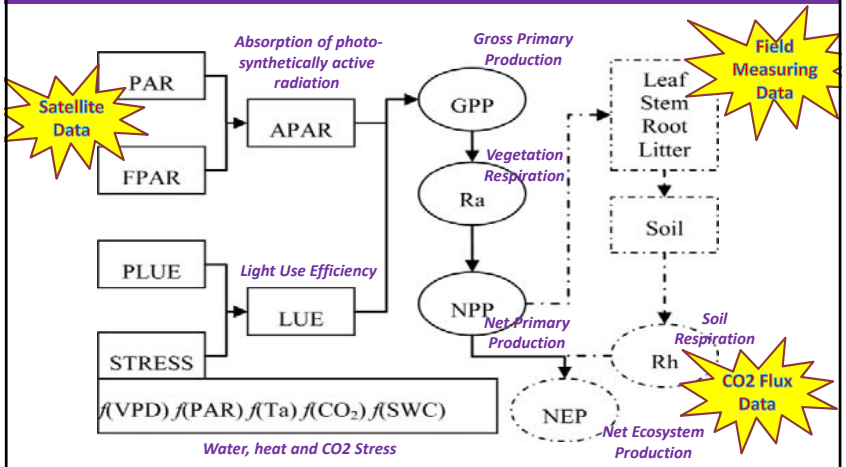


Monitoring of CO2 Sequestration

GOSAT L3 Monthly CO2 column-averaged volume in 2.5° X 2.5° mesh in Mongolia



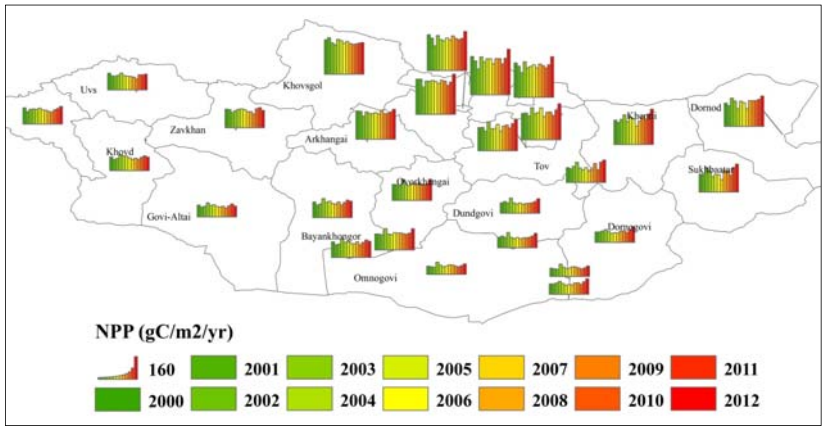
Evaluation of CO2 Sequestration



Integrated Ecosystem Models (IEM) coupling with satellite data

Evaluation of CO2 Sequestration

Regional Changes in NPP estimated by MODIS data (2001-2012)



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Evaluation of CO2 Sequestration

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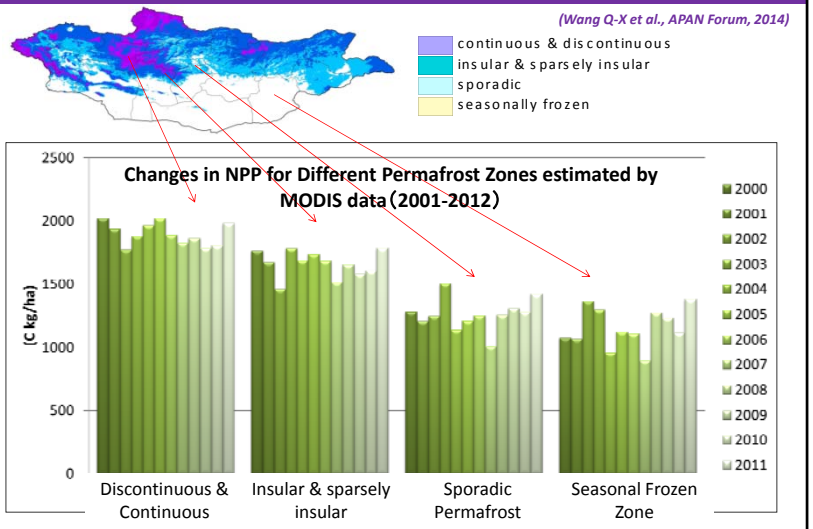
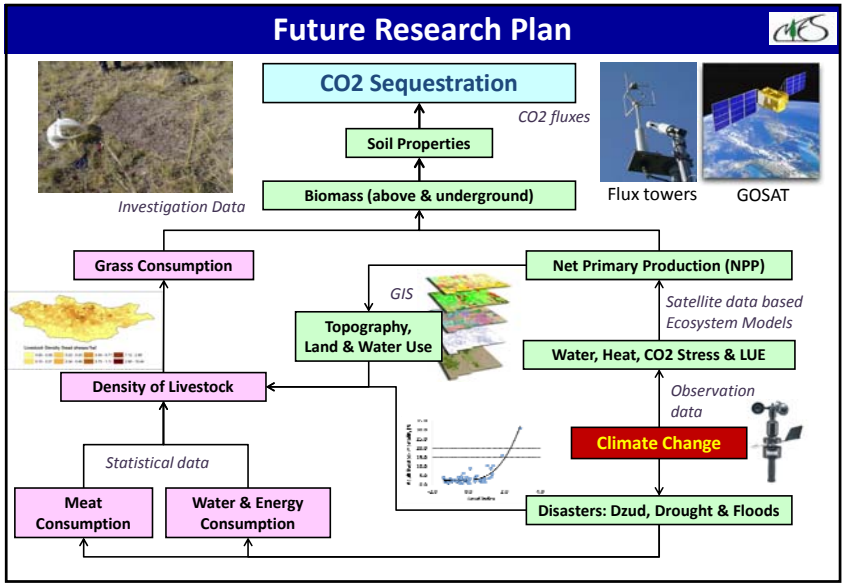


Evaluation of CO2 Sequestration

Reduction of NPP due to Permafrost Degradation

	Area (1980s)	Area (2000s)	Changes in Area	Percentage of Area Change	NPP per km^2	Changes in total NPP
	km^2	km^2	km^2	%	t/km^2	Million t
Seasonal Frozen Zone	572,268	721,374	149,106	8.1	115	1.722
Sporadic Permafrost	292,432	436,528	144,096	7.8	126	1.815
Insular & sparsely insular	701,627	515,479	-186,148	-10.1	166	-3.092
Discontinuous & Continuous	281,886	174,832	-107,054	-5.8	190	-2.030
Total Mongolia	1,848,213	1,848,213	0	0	149	-1.585

Future Research Plan



Future Research Plan

Implementation Items	2015	2016	2017	2018	2019	2020
① Establishment of Integrated Monitoring Systems (IMS) for Water, Heat and CO2 Fluxes measured by Flux Towers and Satellites: GOSAT, MODIS etc.	←	—	—	→		
② Development of Integrated Ecosystem Models (IEM) for CO2 Sequestration coupling with Satellite Data		←	—	—	—	→
③ Development of an Inventory of Water & Energy Consumption for estimation of Livestock Density & Overgrazing	←	—	—	→		
④ Assessment of Regional CO2 Sequestration and Identify its Impact Factors, such as Climate Change, Permafrost Degradation & Overgrazing			←	—	—	→

Future Research Plan

Contribution to the Joint Crediting Mechanism (JCM) Project