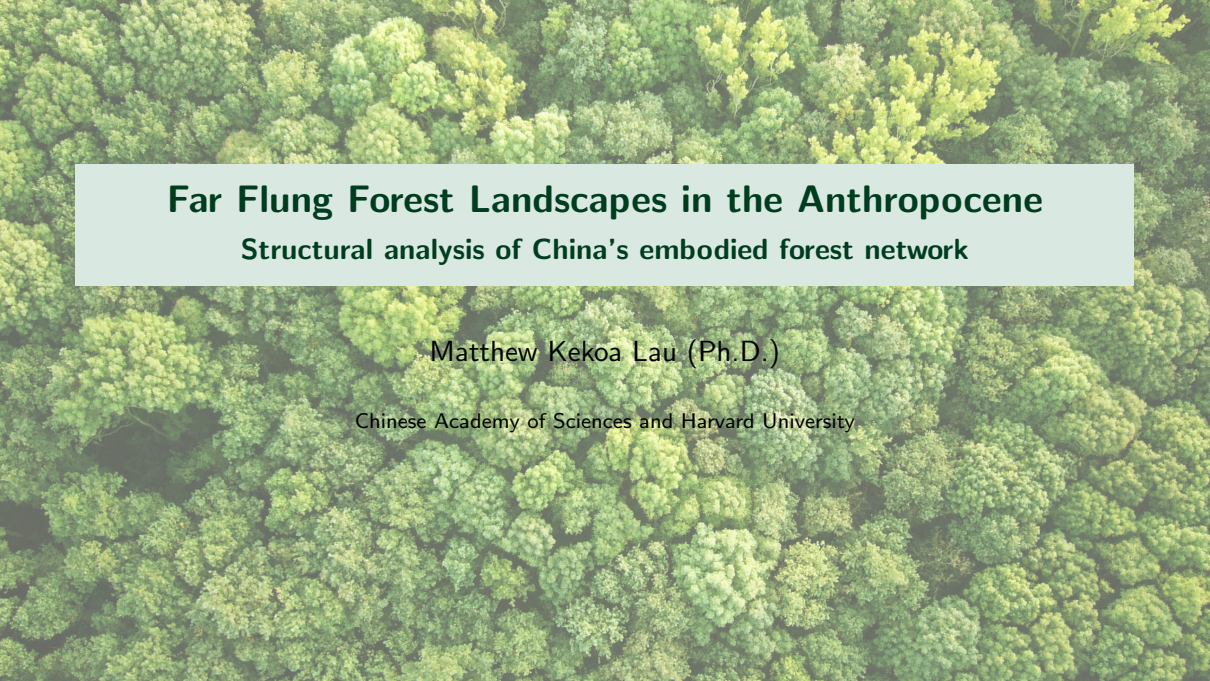

Far Flung Forest Landscapes in the Anthropocene

Structural analysis of China's embodied forest network

Matthew Kekoa Lau (Ph.D.)

Chinese Academy of Sciences and Harvard University


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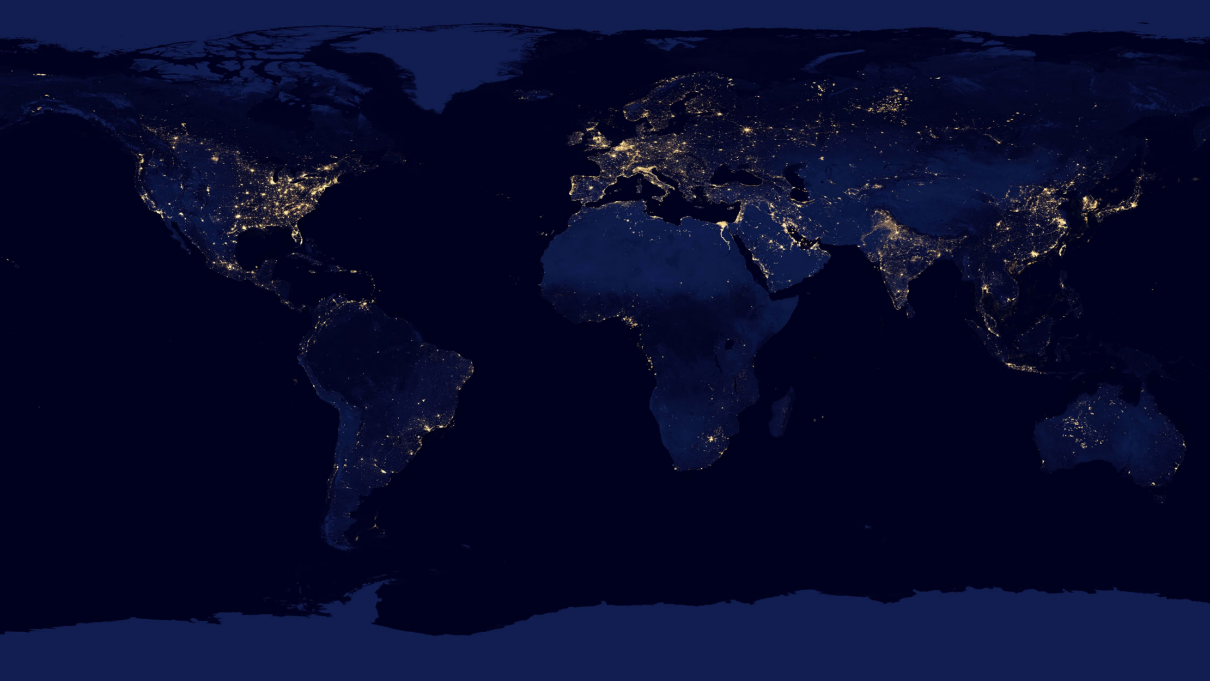
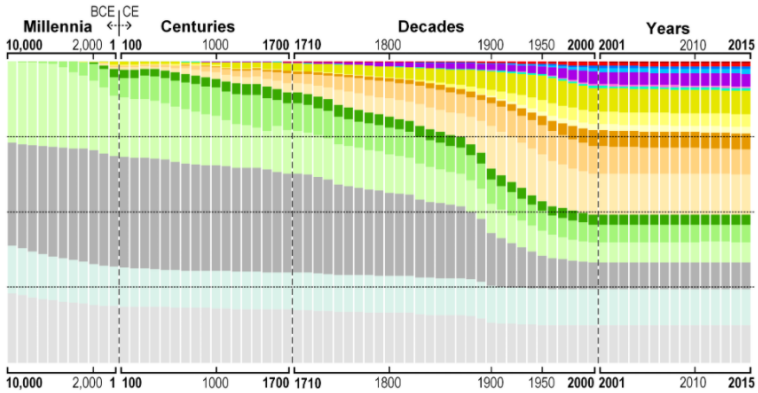
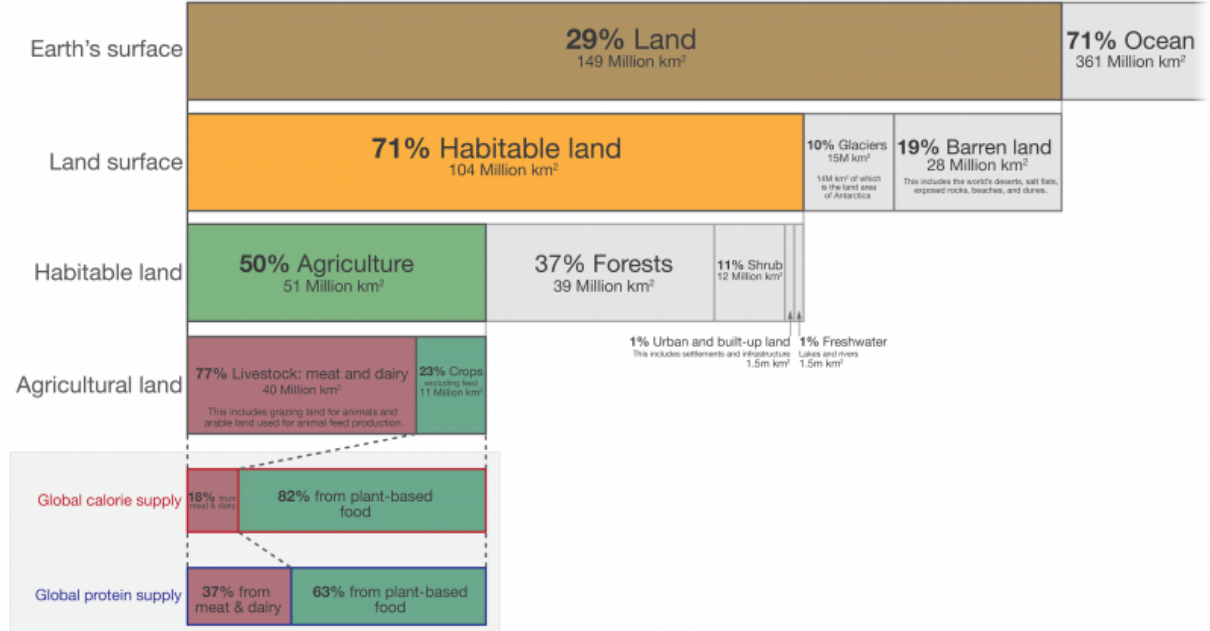


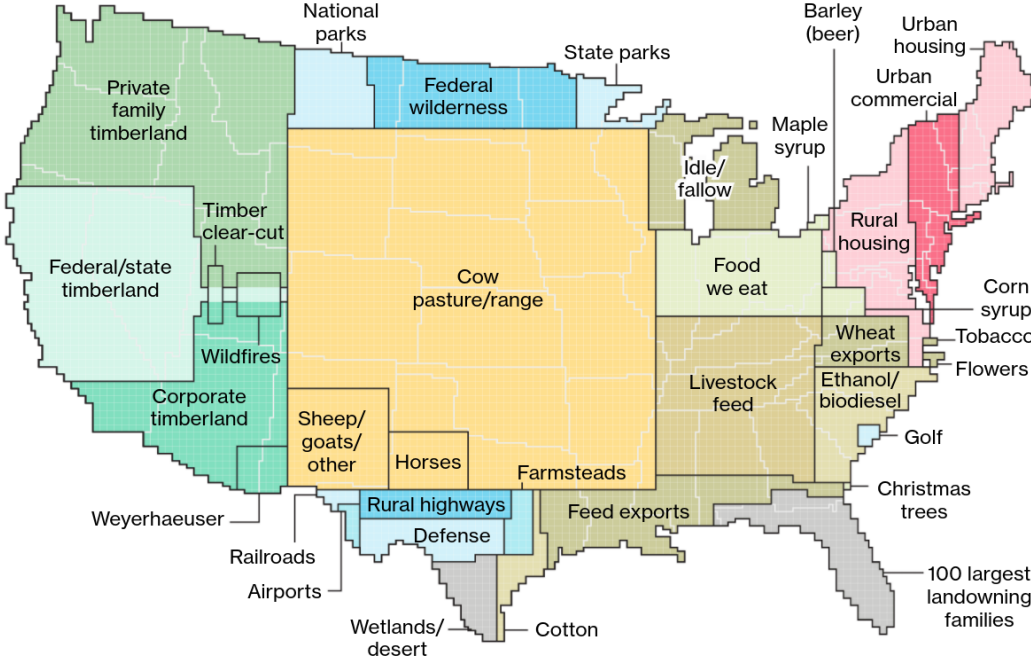
Anthropogenic biomes: 10,000 BCE to 2015 CE

Changes in anthrome classes as % global land area

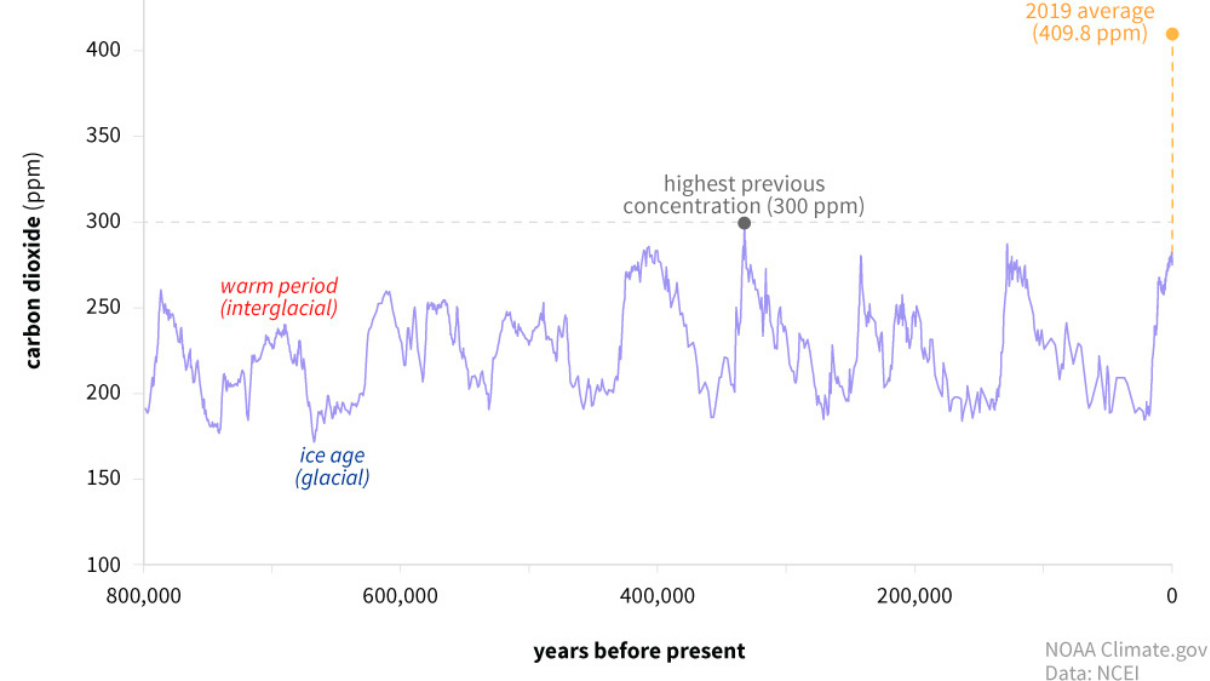


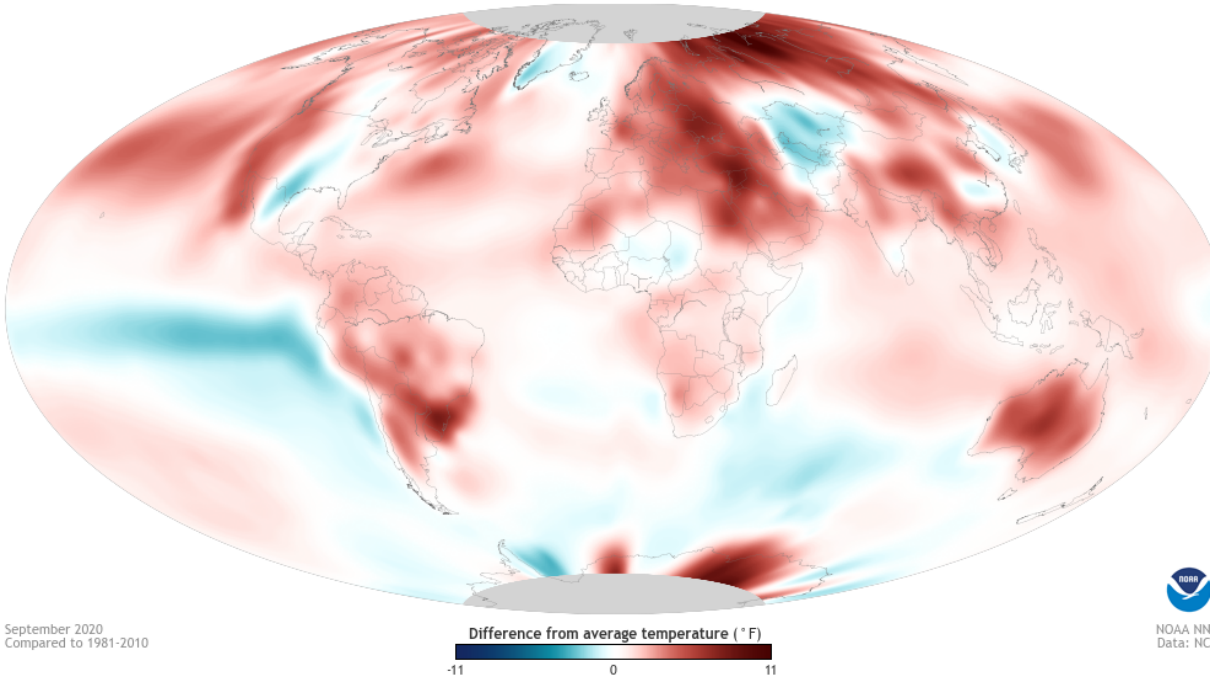


Data source: UN Food and Agriculture Organization (FAO)


National parks
Barley (beer)
Urban housing
State parks
Urban commercial
Private family timberland
Federal wilderness
Maple syrup
Idle/ fallow
Timber clear-cut
Rural housing
Federal/state timberland
Cow pasture/range
Food we eat
Corn syrup
Wheat exports
Tobacco
Wildfires
Flowers
Livestock feed
Ethanol/ biodiesel
Corporate timberland
Sheep/ goats/ other
Golf
Horses
Farmsteads
Christmas trees
Weyerhaeuser
Rural highways
Feed exports
Railroads
Defense
100 largest landowning families
Airports
Wetlands/ desert
Cotton


ECLIPSE Ice Drill


2019 average
(409.8 ppm)
highest previous
concentration (300 ppm)
warm period
(interglacial)
ice age
(glacial)
carbon dioxide (ppm)
400
350
300
250
200
150
100
800,000
600,000
400,000
200,000
0
years before present
NOAA Climate.gov
Data: NCEI


September 2020
Compared to 1981-2010
Difference from average temperature (°F)
-11
0
11
NOAA NN
Data: NC


A LA MARINE

Forests in the Anthropocence

- Forests are changing from human impacts

Forests in the Anthropocence

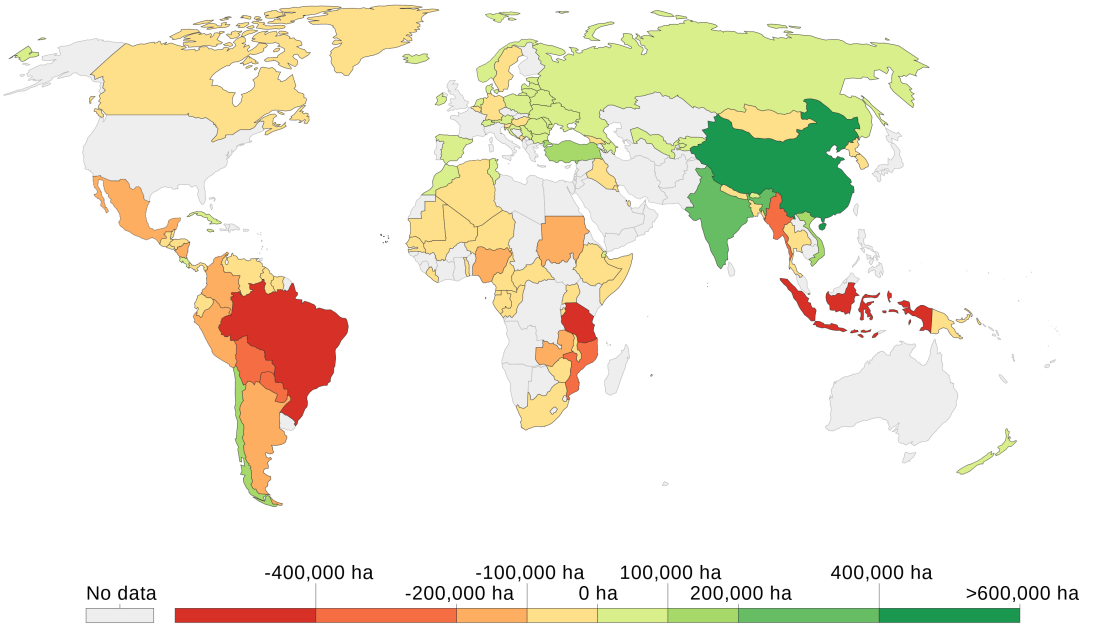
- Forests are changing from human impacts
- Large direct effects of land-use

Forests in the Anthropocence

- Forests are changing from human impacts
- Large direct effects of land-use
- How do we address indirect and systems-level effects?

Today's Talk

1. Economic and Ecological Landscape Extensions
2. Trade Networks of Forest Landscapes
3. Global Forest Networks
4. China's Forest Networks: Global
5. China's Forest Networks: Domestic/Local
6. Conclusions
7. Future Work

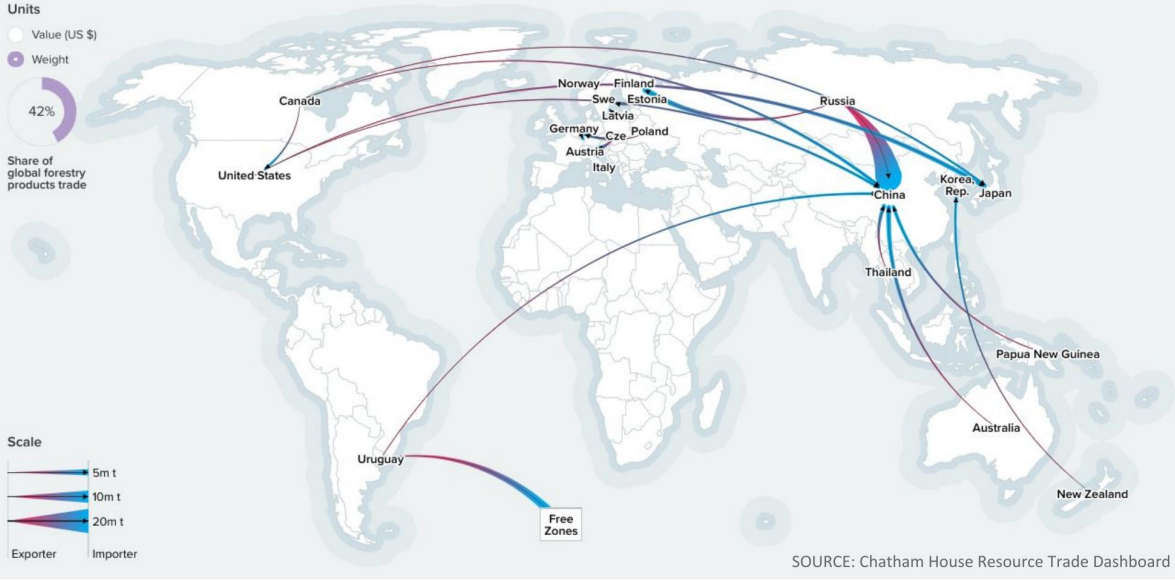


Source: UN Food and Agriculture Organization (FAO). Forest Resources Assessment.

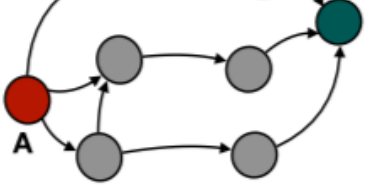
Economic and Ecological Landscape Extensions

D

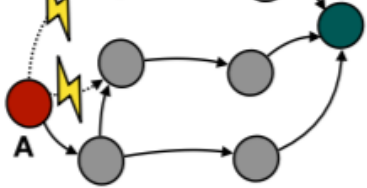
China Imports 2018: Wood (Lumber and Sawn)



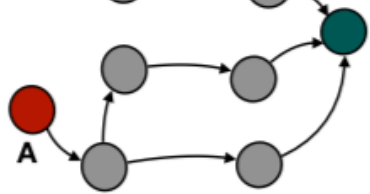
SOURCE: Chatham House Resource Trade Dashboard



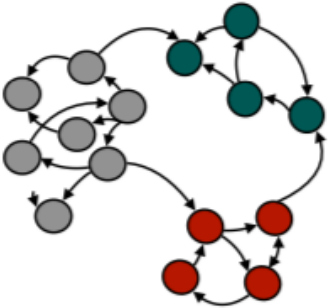
Redundant pathways between A and B

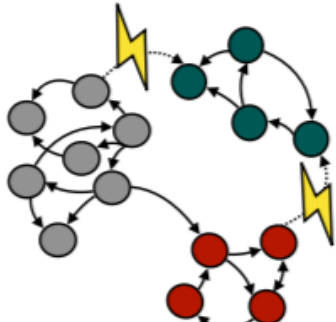


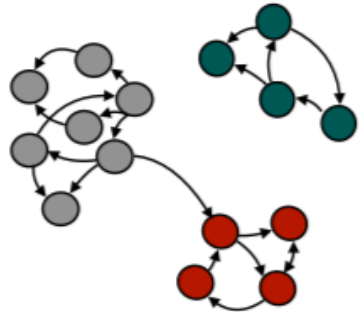
Shock in the system



Perseverance of pathway between A and B







has been a widely used approach in the literature as it takes into consideration both variety and balance (Sterling, 2010). It is defined as:

$$H = -\Sigma_i p_i \ln(p_i)$$

Here p_i indicates the proportion of category i within the total categories. The above formula can be rewritten in terms of systems process as:

$$H = -\sum \frac{T_{ij}}{T_{..}} \ln \frac{T_{ij}}{T_{..}}$$

Where, T_{ij} represents the effect that element i has on element j and the period signifies summation over that index.

From the above formulas it is evident that a higher value of H indicates

and conditional entropy of a network system (Rutledge et al., 1976; R.E. Ulanowicz & Norden, 1990) is used to define redundancy (ψ) as:

$$\psi = -k \sum_{i,j} \frac{T_{ij}}{T_{..}} \ln \frac{T_{ij}^2}{T_{i.} T_{.j}}$$

Here, T_{ij} is the flow from node i to node j, $T_{i.} = \sum_j T_{ij}$ is the total flow leaving node i, $T_{.j} = \sum_i T_{ij}$ is the total amount of medium entering node j and the sum of all flows in the system, $T_{..} = \sum_{ij} T_{ij}$, is known as the "total system throughput" (*TST*).

Redundancy refers to the replication of pathways, functions, or compo-

R. Pritchard[4,6] and A. Chhatre[2]

Forest restoration occupies centre stage in global conversations about carbon removal and biodiversity conservation, but recent research rarely acknowledges social dimensions or environmental justice implications related to its implementation. We find that 294.5 million people live on tropical forest restoration opportunity land in the Global South, including 12% of the total population in low-income countries. Forest landscape restoration that prioritizes local communities by affording them rights to manage and restore forests provides a promising option to align global agendas for climate mitigation, conservation, environmental justice and sustainable development.

Forest restoration is considered to be a crucial strategy for conserving global biodiversity and mitigating climate change[1–3]. New research identifies the global extent of forest restoration

world's biodi
opportunitie
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number of b
populated la

Forest res
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legitimate) a


中国移动


林芝
LIN ZHI


后院
车库
WiFi

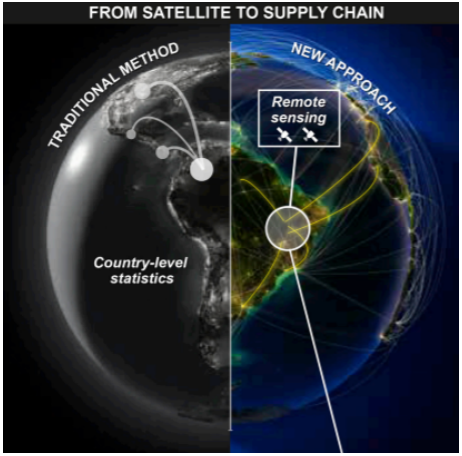

然保
杨尚昆
严厉

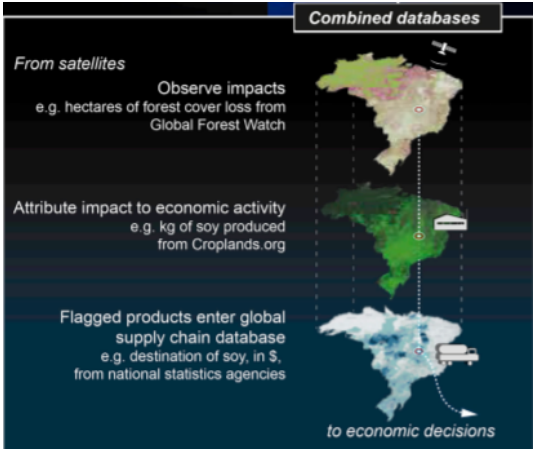
China's Forest Networks: Domestic/Local

Conclusions

Future Work

Future Work


FROM SATELLITE TO SUPPLY CHAIN
TRADITIONAL METHOD
NEW APPROACH
Remote sensing
Country-level statistics


Combined databases
From satellites
Observe impacts
e.g. hectares of forest cover loss from Global Forest Watch
Attribute impact to economic activity
e.g. kg of soy produced from Croplands.org
Flagged products enter global supply chain database
e.g. destination of soy, in $, from national statistics agencies
to economic decisions

Acknowledgements

[1] [2] [3] [5]

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