SEI STOCKHOLM ENVIRONMENT INSTITUTE U.S. Center

WISDOM
Woodfuel Integrated Supply/Demand Overview Mapping

Centro de Investigaciones en Ecosistemas
UNAM Campus Morelia

CENTRO DE INVESTIGACIONES EN GEOGRAFÍA AMBIENTAL CIGA
CENTRO DE INVESTIGACIONES EN GEOGRAFÍA AMBIENTAL

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

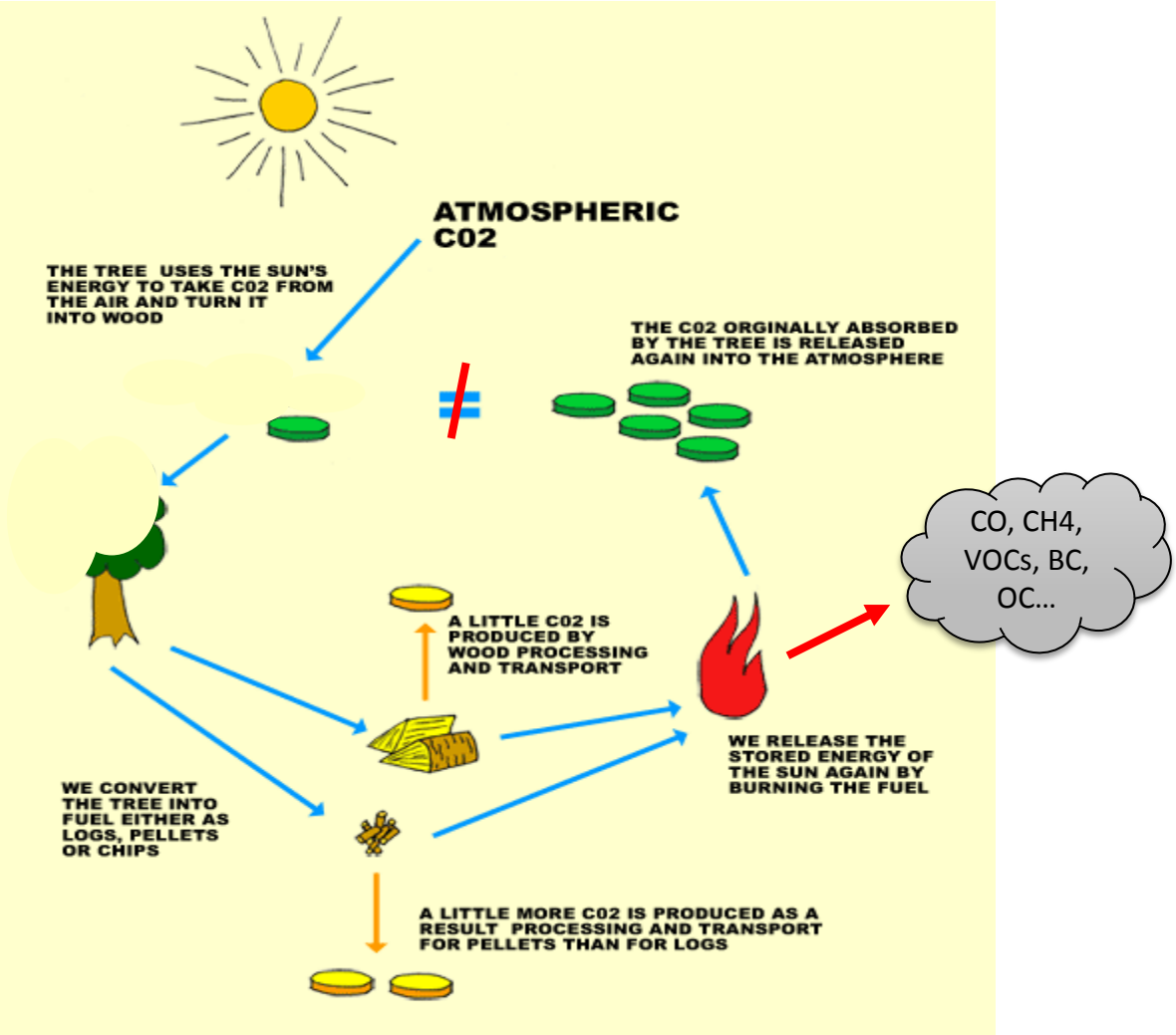
Setting the scene: sustainability of traditional wood energy

Rob Bailis, Rudi Drigo, Omar Masera, and Adrian Ghilardi

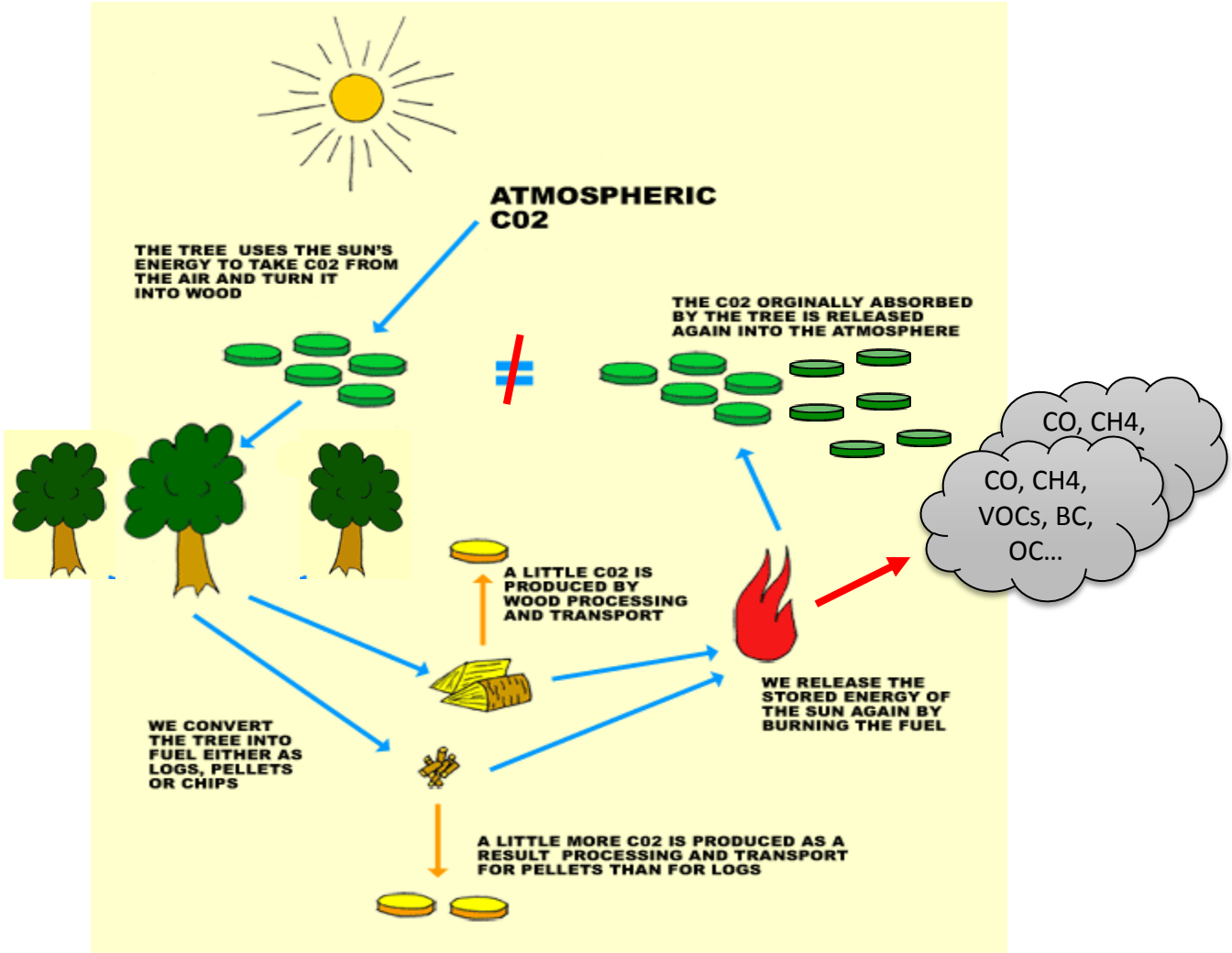
Expert Exchange Workshop on the Promotion of Sustainable Wood Energy Value Chains in Development Cooperation
March 1st - 2nd in Frankfurt am Main

Organised by giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) Gmb KFW

What is “non-renewable biomass”?

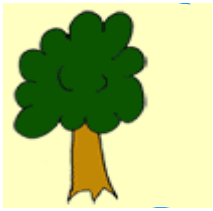


What is “non-renewable biomass”?

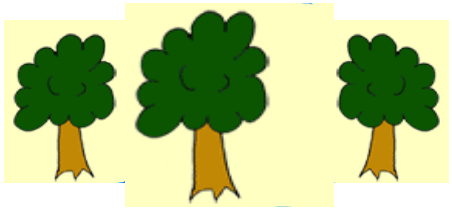


What is “non-renewable biomass”?

Biomass harvested in excess of the landscape’s productive capacity is non-renewable.

If the landscape can produce  in a year,

But we harvest this,

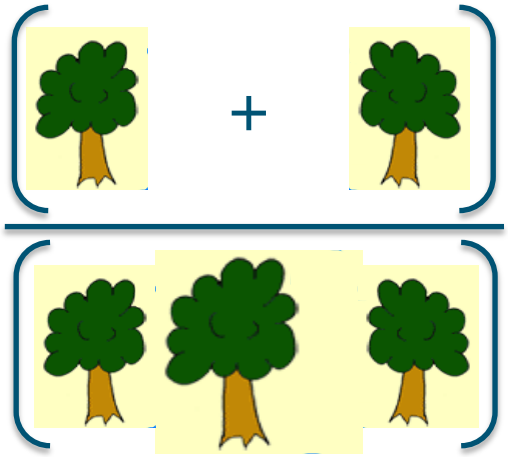


Then NRB =  + 

What is “non-renewable biomass”?

We can estimate emission reductions using the **ratio of NRB to total consumption** or “fNRB”

$$fNRB = \frac{(\text{NRB} + \text{NRB})}{(\text{NRB} + \text{NRB} + \text{NRB})}$$

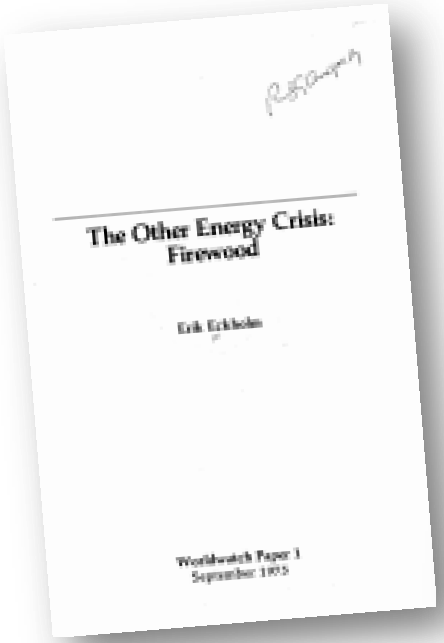


For example, Gold Standard uses fNRB to quantify GHG emissions:

$$PE_{j,y} = B_{j,y} \cdot ((f_{NRB,j,y} \cdot EF_{fuel,CO2}) + EF_{fuel,nonCO2}) \cdot NCV_{fuel}$$

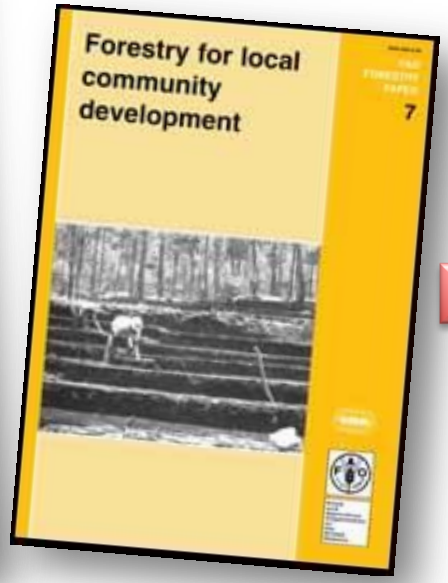
Is this really a problem?

In the 70s and 80s, woodfuels were considered major drivers of deforestation…



The "Other Energy Crisis"

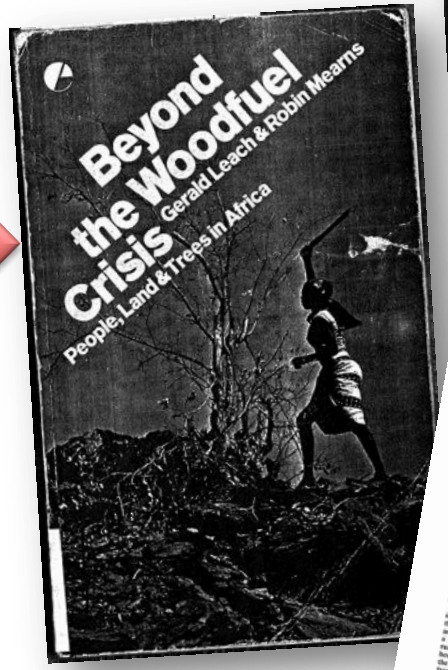
Worldwatch 1975

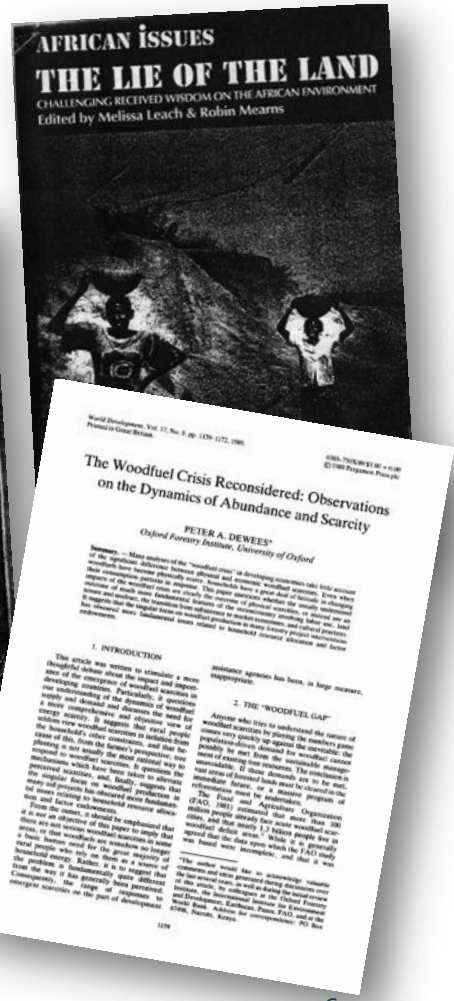


…leading to "treeless wastes in peri-urban areas in many parts of Africa"

FAO 1978

By the 1990s a different story emerged…





More recent studies? Still ambiguous…

Woodfuels are…

"not a significant cause of deforestation" and provide "important livelihood opportunities" in **Botswana**

Hiemstra-Van der Horst & Hovorka, 2008

causing "severe deforestation" in **India (Uttarakhand)**

Singh et al., 2010

driving "wave-fronts" of degradation in **Tanzania**

Ahrends et al., 2010

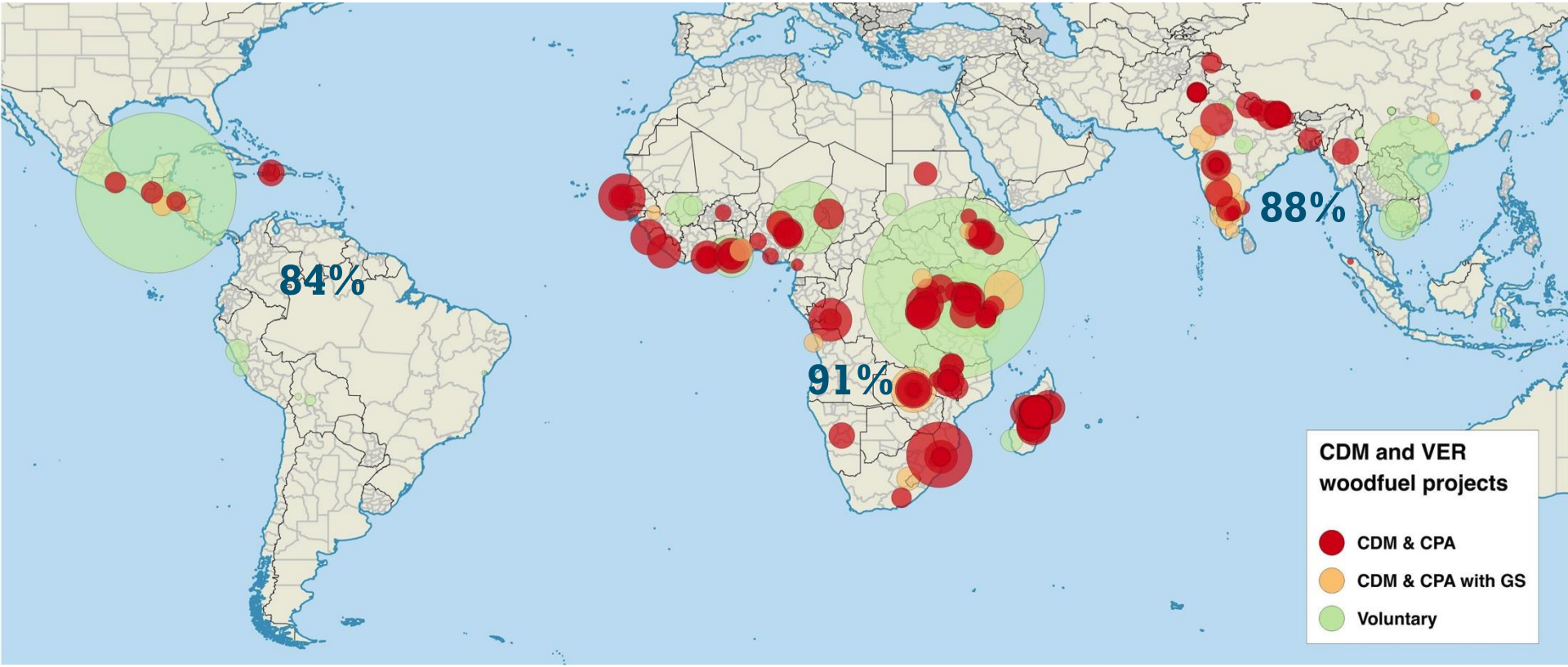
"adapted to changing circumstances" and likely to provide "continued cheap fuel supply" in **Mali**

Hansfort & Mertz, 2011

"the main degradation driver for the **African continent**, and…small to moderate importance in **Asia** and **Latin America**"

Hosonuma et al, 2012

Project developers assume the worst…

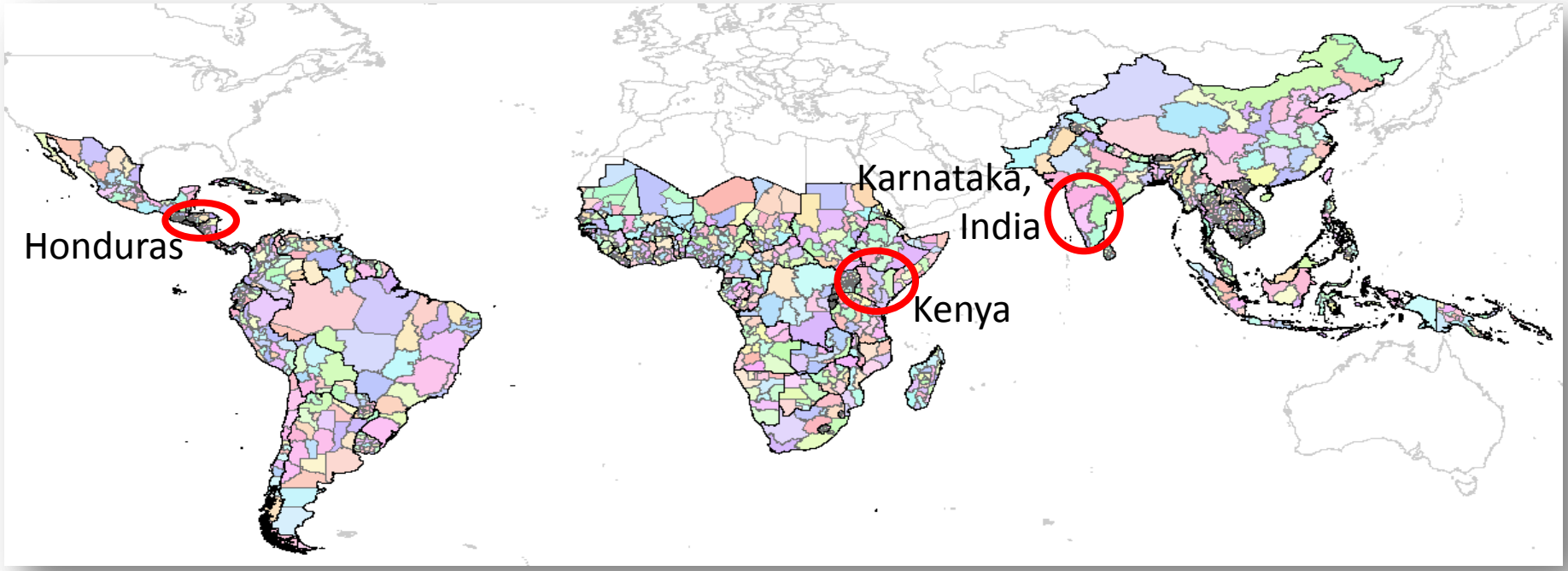


Global median fNRB of 287 carbon projects is **88%**

Can we get a clearer picture?

- How sustainable is woodfuel consumption?
- Where are likely woodfuel "**hotspots**" and how many people are affected?
- What are **climate impacts** and potential for mitigation?

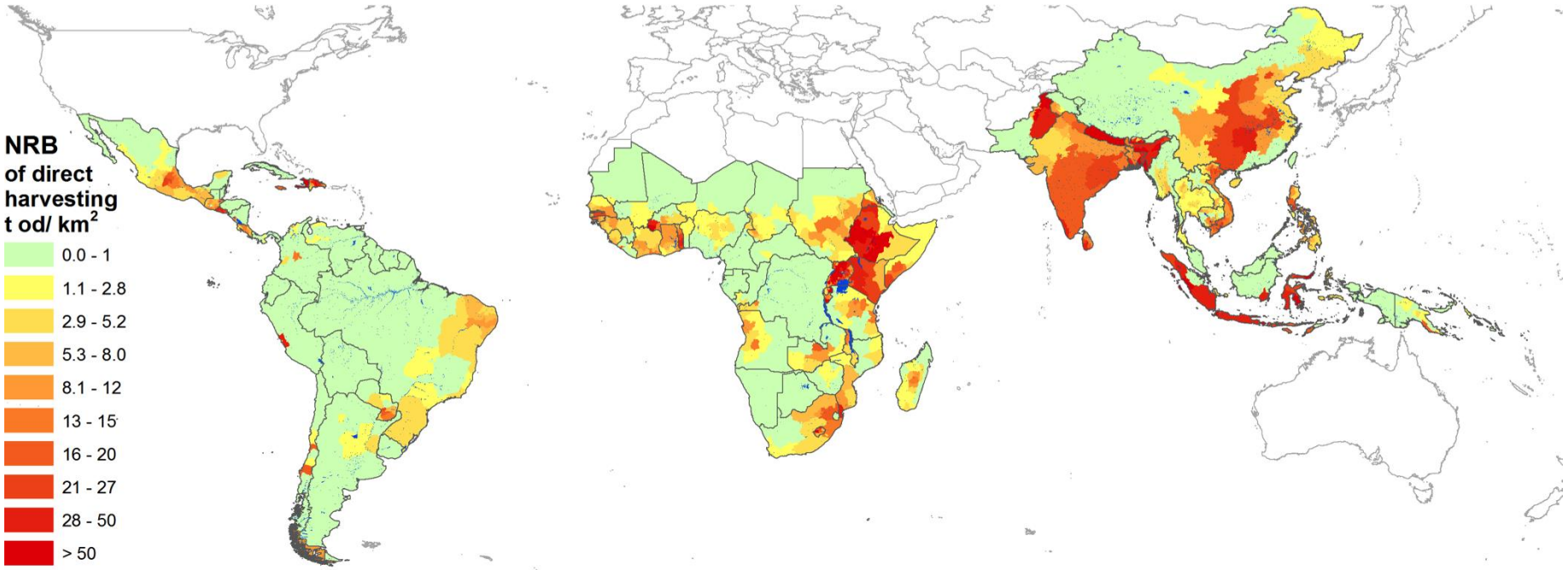
Project Scope



- "Global" assessment: 88 countries; 1482 sub-nat'l units
- Based on "WISDOM" methodology
- 3 meso- and local-scale case studies
- Local case studies are **dynamic**

Results of the global assessment

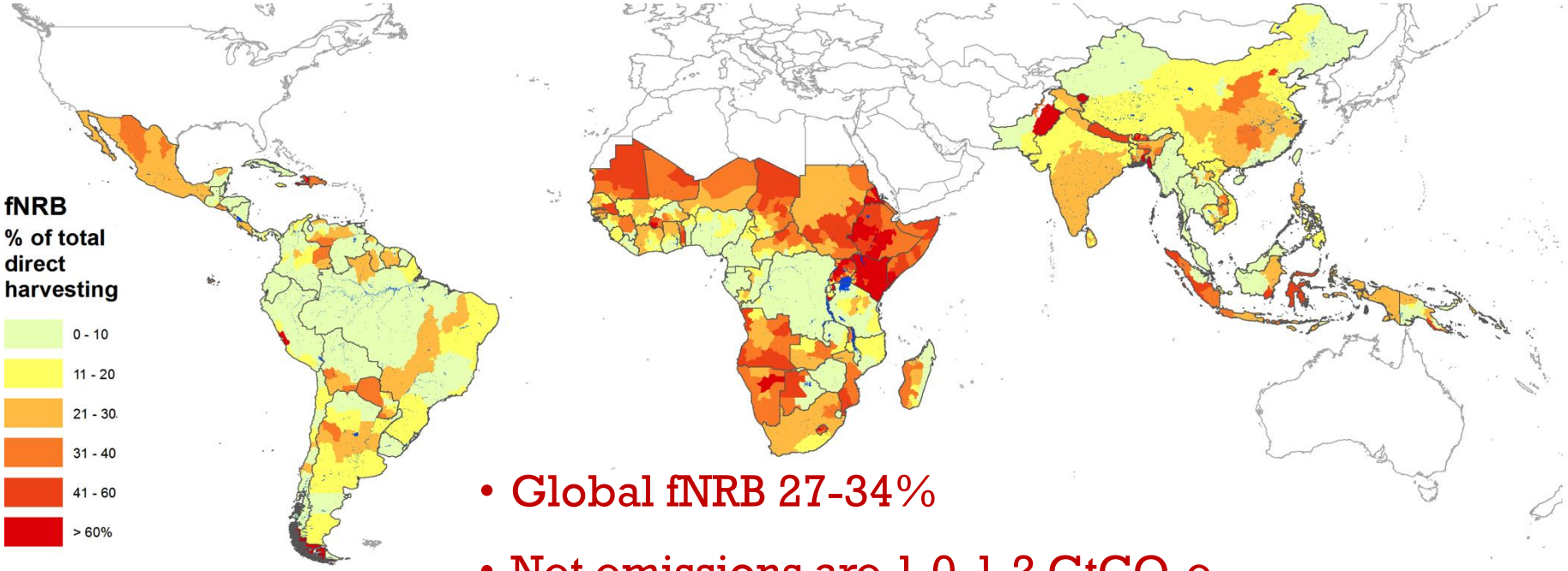
NRB



- Current woodfuel demand is ~1.4 Gton/yr *
- Global NRB is 300-350 Mton/yr

Results of the global assessment

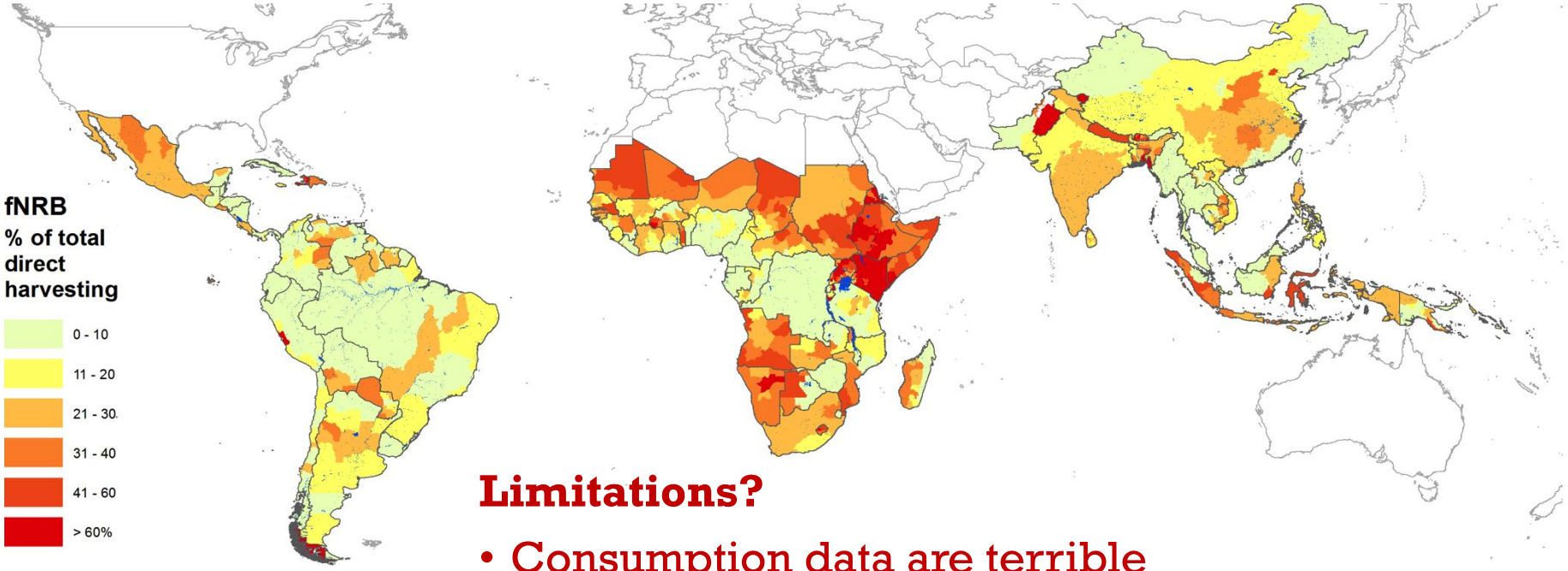
fNRB



- Global fNRB 27-34%
- Net emissions are 1.0-1.2 $GtCO_2e$
- Hotspots: fNRB > 50% in E Africa, S Asia
  - 275 million people affected

Results of the global assessment

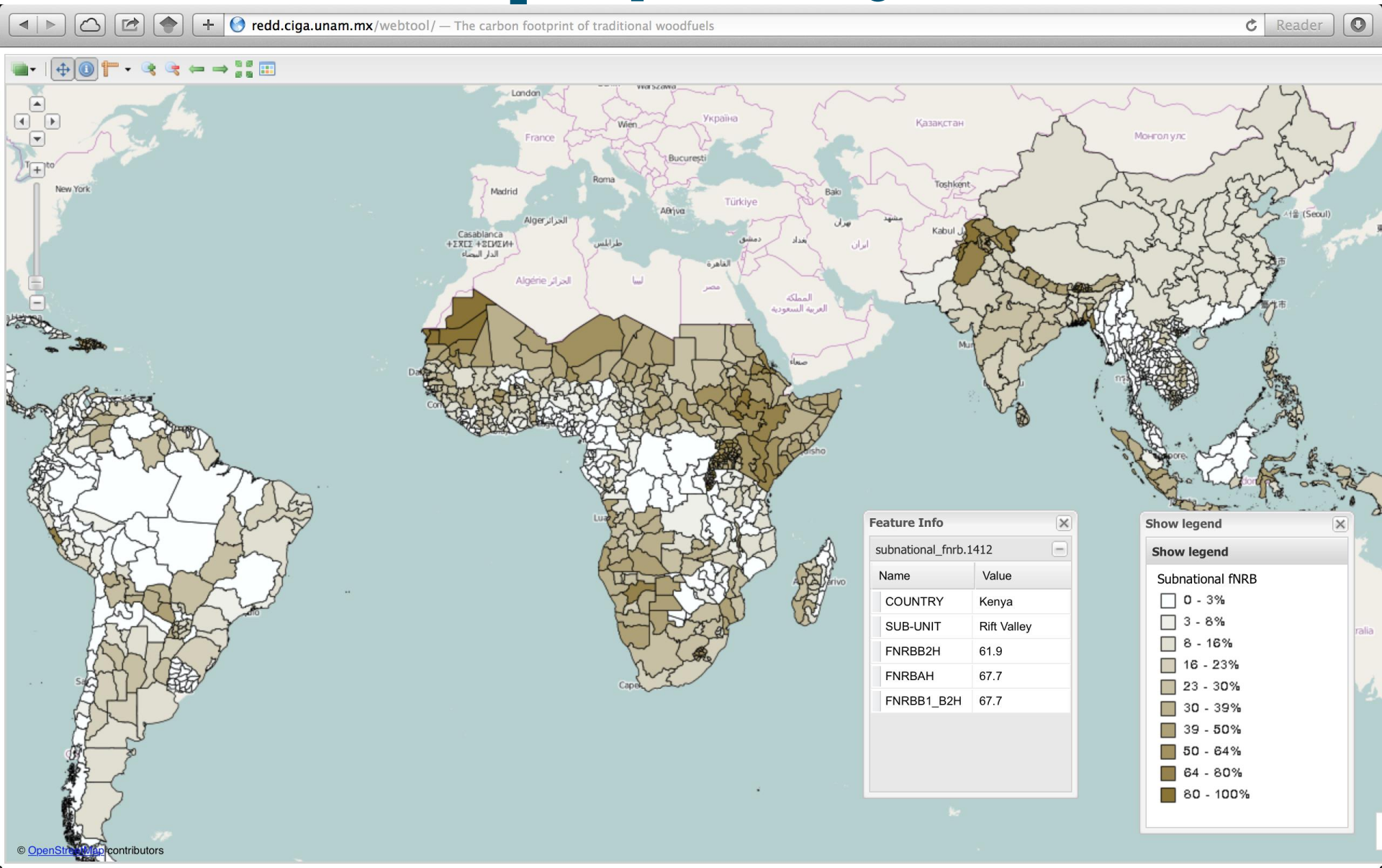
fNRB



Limitations?

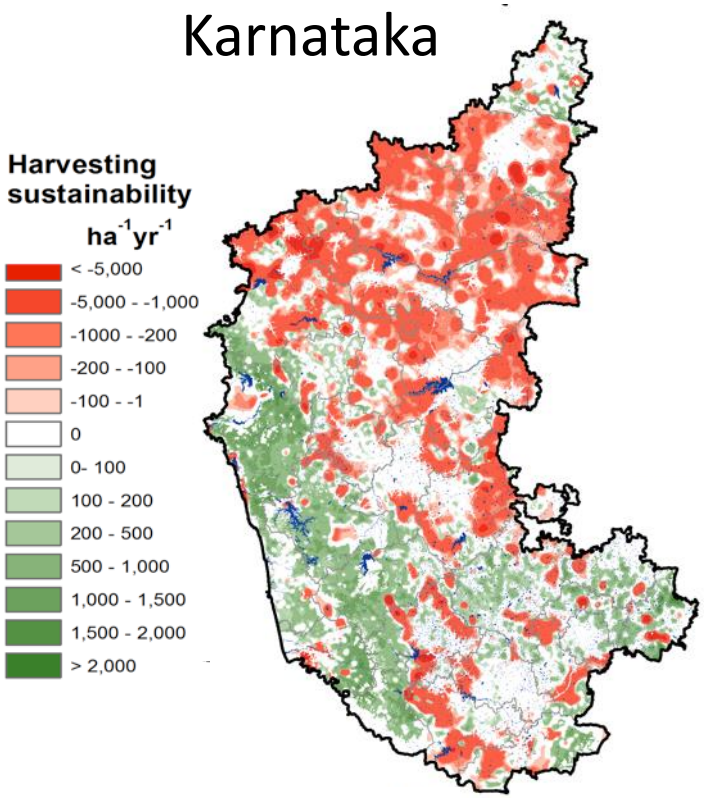
- Consumption data are terrible
- Assumptions are largely untested
  - Other drivers of LUC?
  - Sub-optimal harvesting?

Web-based map: http://redd.ciga.unam.mx/webtool/

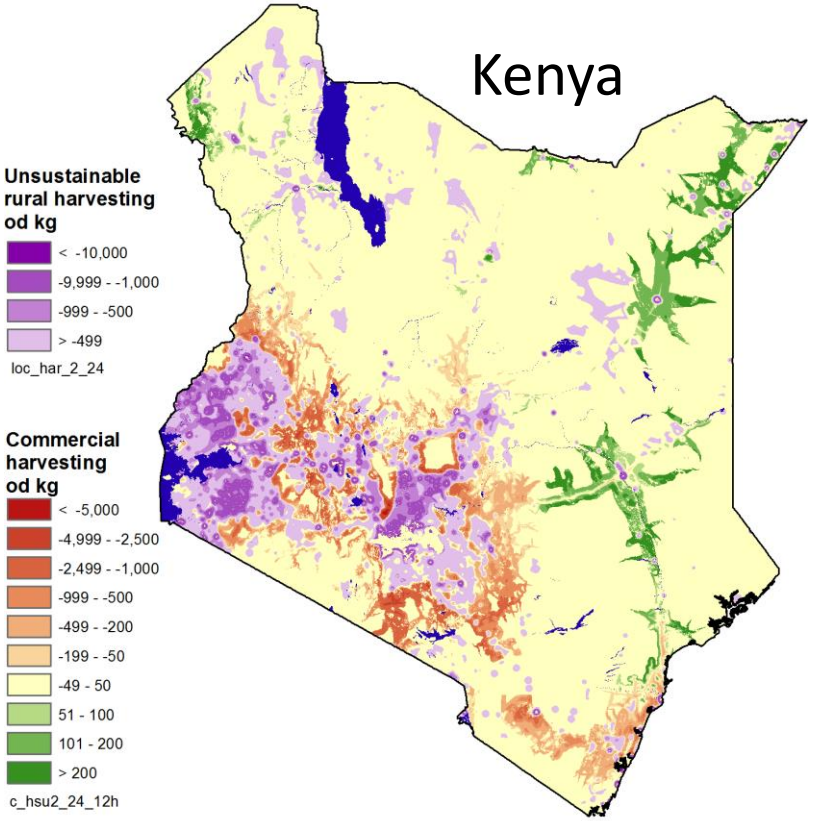


Meso-scale studies

Karnataka



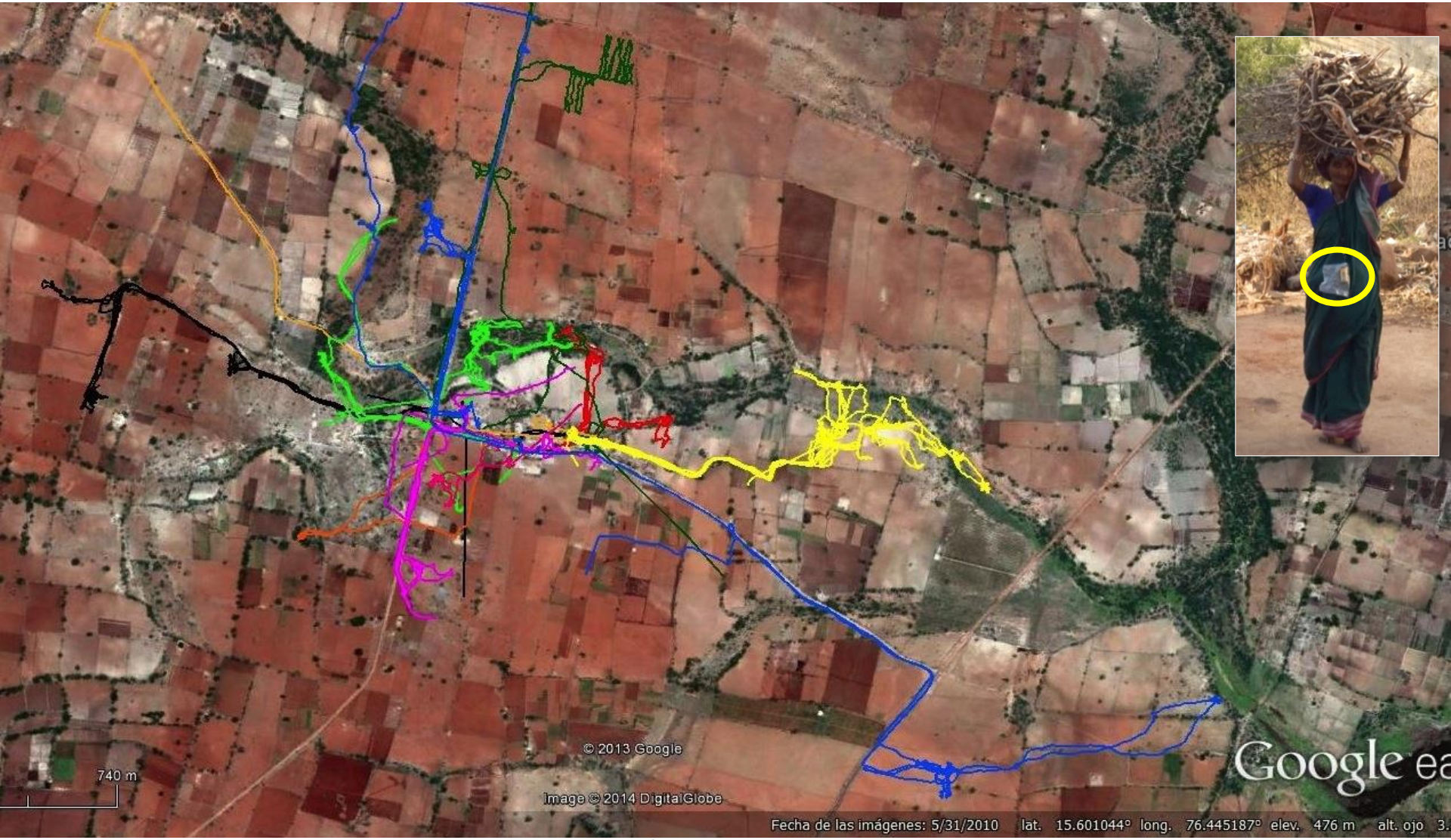
Kenya

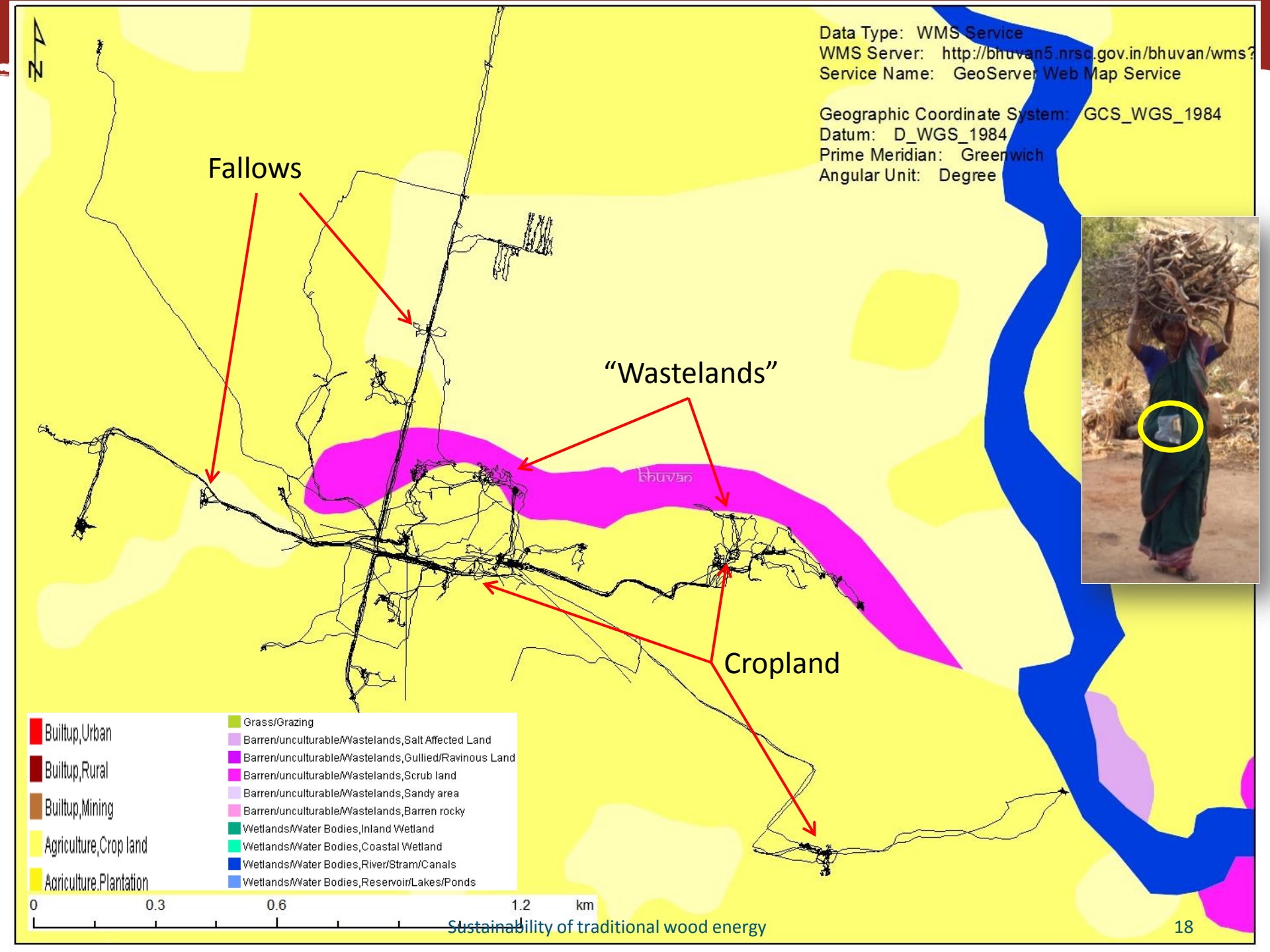


- Same approach with more detailed data, expert consultations, etc
- Incorporate more contextual assumptions
- "Validate" global assessment

Micro-scale: data from real people

Wood collectors' paths in Central Karnataka



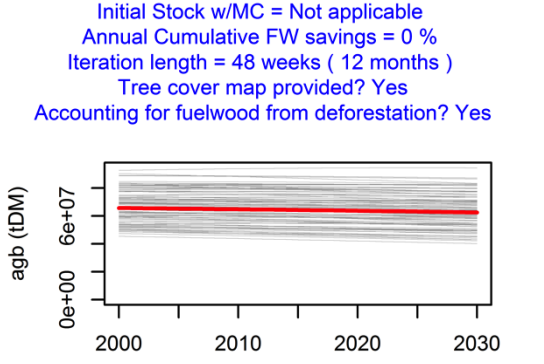

Data Type: WMS Service
WMS Server: http://bhuvan5.nrsc.gov.in/bhuvan/wms?
Service Name: GeoServer Web Map Service
Geographic Coordinate System: GCS_WGS_1984
Datum: D_WGS_1984
Prime Meridian: Greenwich
Angular Unit: Degree
Fallows
"Wastelands"
Cropland
Builtup,Urban
Builtup,Rural
Builtup,Mining
Agriculture,Crop land
Agriculture,Plantation
Grass/Grazing
Barren/unculturable/Wastelands,Salt Affected Land
Barren/unculturable/Wastelands,Gullied/Ravinous Land
Barren/unculturable/Wastelands,Scrub land
Barren/unculturable/Wastelands,Sandy area
Barren/unculturable/Wastelands,Barren rocky
Wetlands/Water Bodies,Inland Wetland
Wetlands/Water Bodies,Coastal Wetland
Wetlands/Water Bodies,River/Stram/Canals
Wetlands/Water Bodies,Reservoir/Lakes/Ponds
0
0.3
0.6
1.2
km

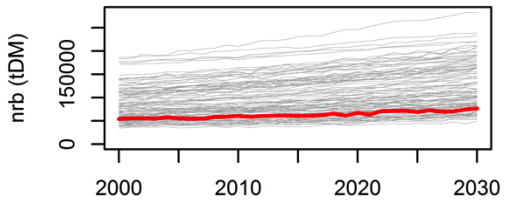
NRB.v1.0 model at meso- and micro-scales

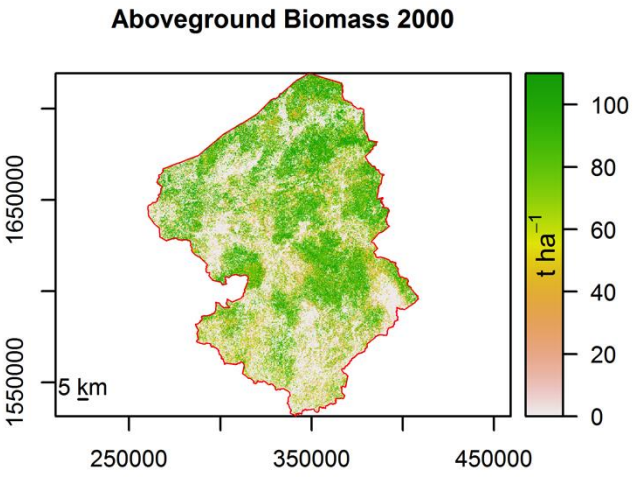
- Dynamic simulations
  - Explicit LUC component
  - Uncertainty and stochasticity
- All freeware platforms
- *3 levels of user interaction*:
  1. Use default supply data, input basic demand parameters (no GIS expertise needed)
  2. Input some supply parameters from a given study area (some GIS expertise needed)
  3. Customize geoprocessing algorithms (GIS and R- expertise needed)

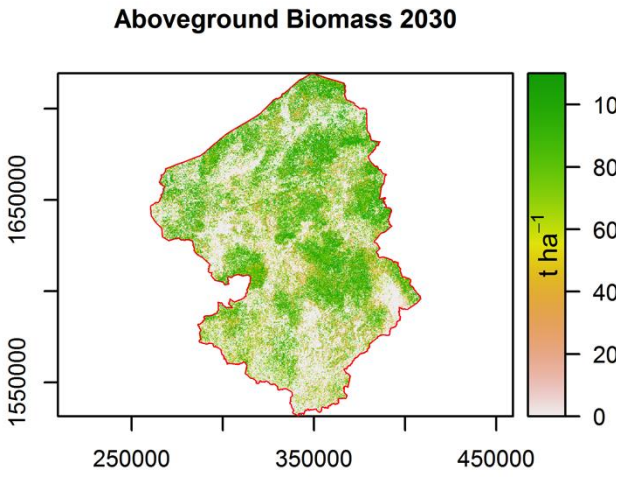
Model Outputs

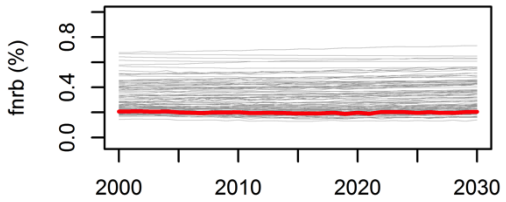
- Using empirical measurements of:
  - Fuel consumption
  - Biomass growth
  - Travel velocities etc etc…

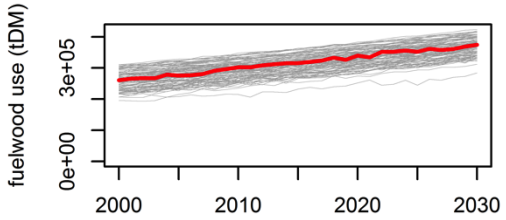












Next steps…

Research

- Validate model using independent datasets and field assessments
- Incorporate multiple LUC drivers
- Include behavioral elements

Outreach

- Make modeling more user-friendly for non-technical practitioners
- Trainings and workshops
- Advocate change in C/VER methodologies?

For more information:

- NRB case studies in 20+ countries
  - http://www.wisdomprojects.net/global/cs.asp
- Global NRB Assessment
  - http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2491.html
  - http://www.wisdomprojects.net/global/csdetail.asp?id=31
- Global NRB map
  - http://redd.ciga.unam.mx/webtool/
- NRB.v2.0 – coming soon

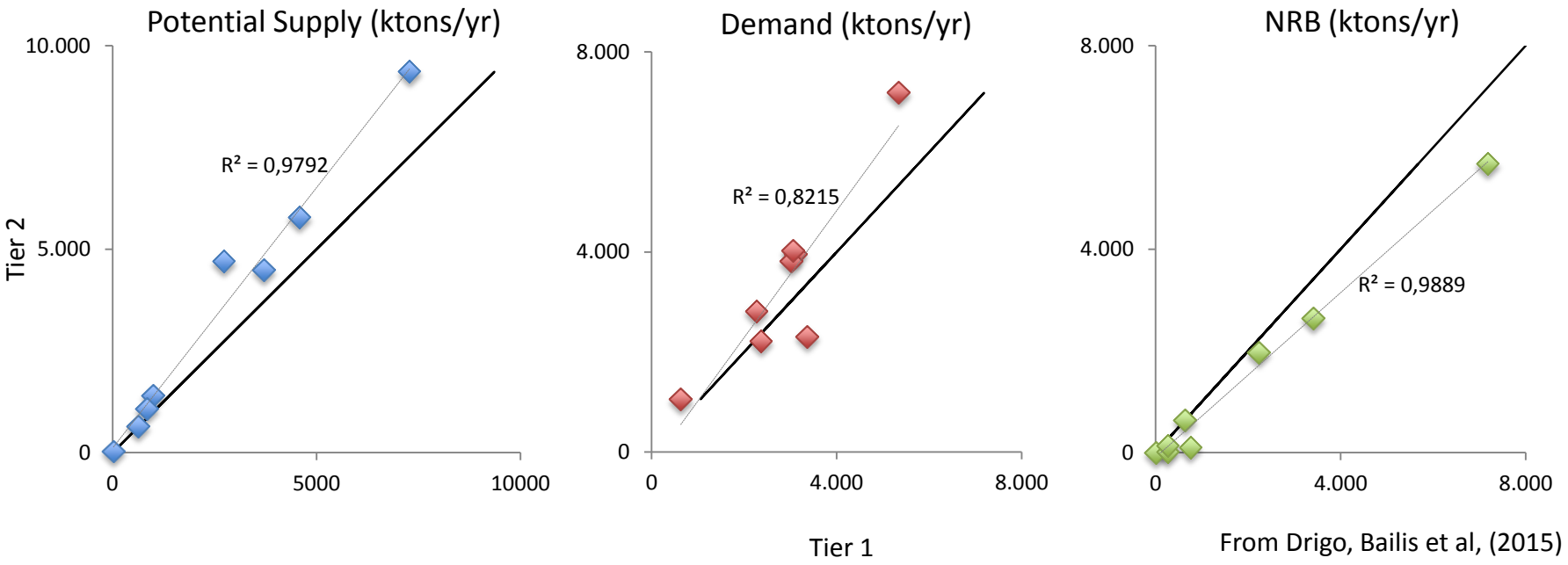
Thank You!

NRB.v1.0 workshops

- Argentina
- Kenya
- Mexico
- Ghana

Intermediate-scale analyses

Comparison of Provincial-level results in Kenya



From Drigo, Bailis et al, (2015)

- Potential supply was consistently higher in Tier 2 assessment
- Demand was also higher except in Nbi and Coast (urban influence)
- NRB was lower in all Provinces except Central