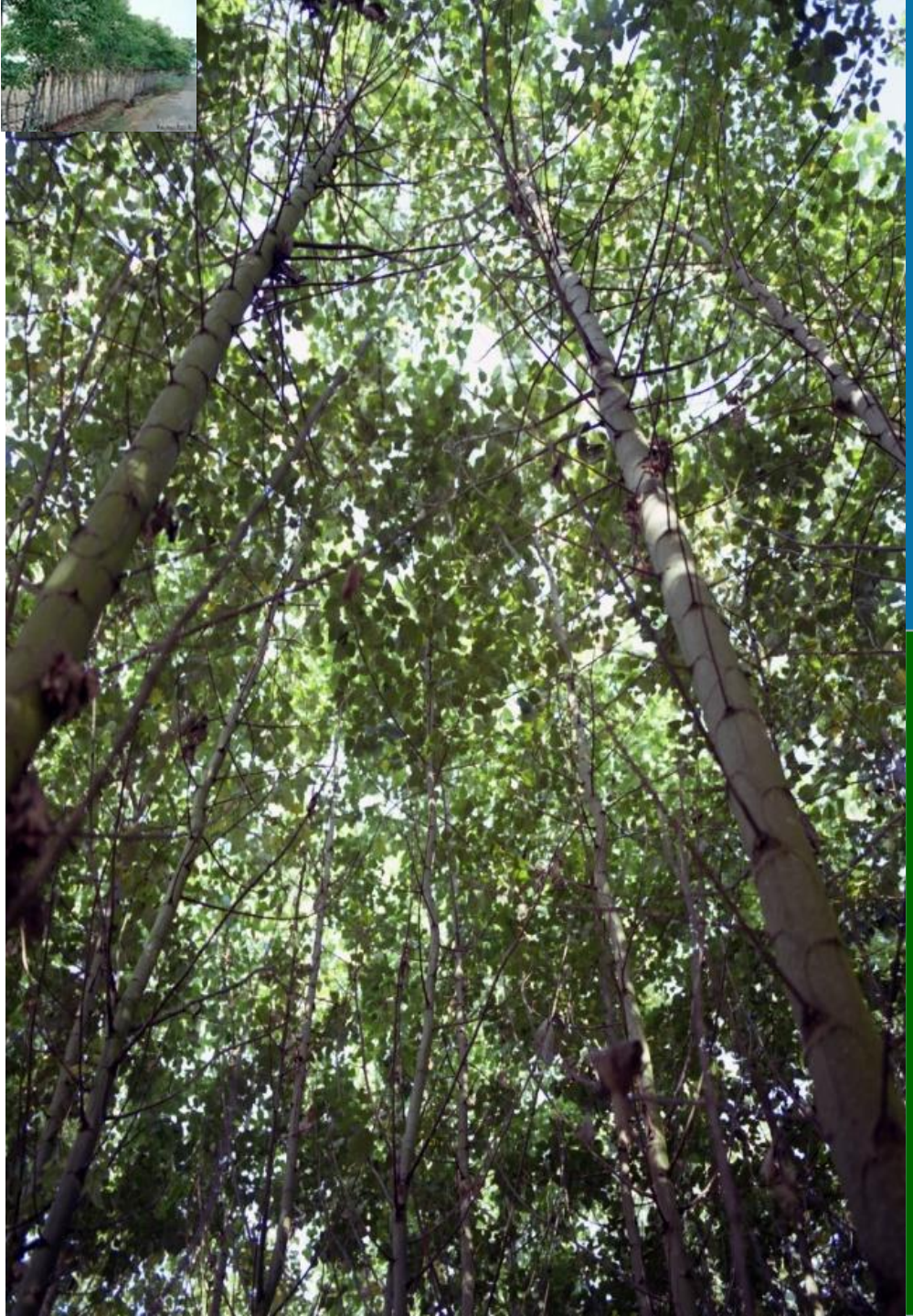

Setting the Stage for Sustainable Expansion of Wood-Based Energy

TICAD VI - Special Event on the Future of Wood-Based Energy

World Agroforestry Centre
Nairobi, 25 August 2016

Jeff Skeer
International Renewable Energy Agency (IRENA)

International Renewable Energy Agency

IRENA
International Renewable Energy Agency

Established: April 2011

Mission: Accelerate deployment of renewable energy

Strategy: Hub, voice and objective information source for RE

Members: 176 countries engaged; 149 ratified (23 June 2016)

Mandate: Sustainable deployment of the six RE resources (Biomass, Geothermal, Hydro, Ocean, Solar, Wind)

Location: Headquarters in Abu Dhabi, United Arab Emirates
Innovation and Technology Centre: Bonn, Germany

Lead: Director-General, Adnan Amin

UN on Renewable Energy and Forests

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International Renewable Energy Agency

Article 5.1: Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases … including forests.

Preamble: need to promote universal access to sustainable energy in developing countries, in particular in Africa, through the enhanced deployment of renewable energy.

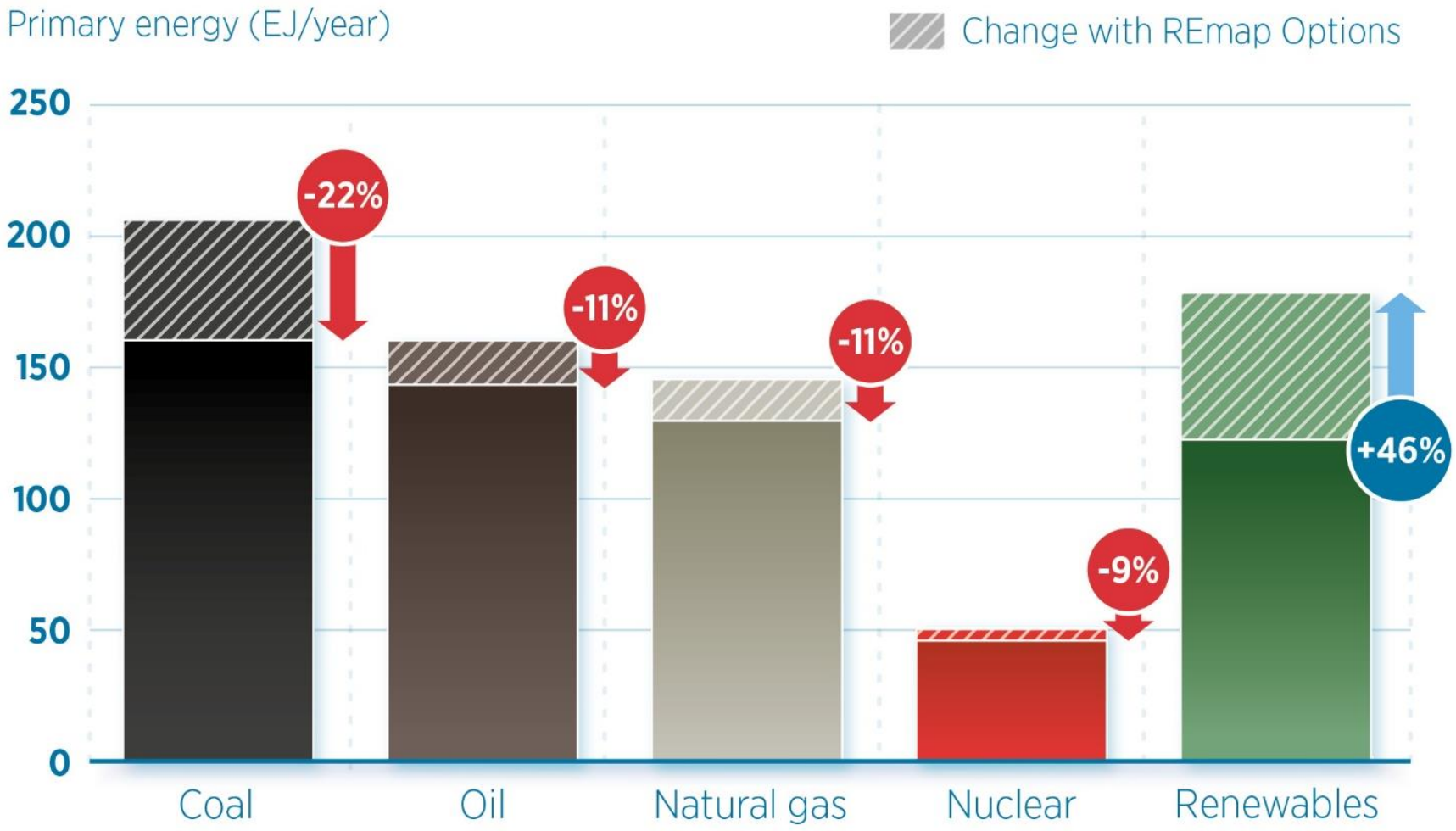
http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf

Sustainable Development Goal 7
Ensure access to affordable, reliable, sustainable and modern energy for all

Sustainable Development Goal 15
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

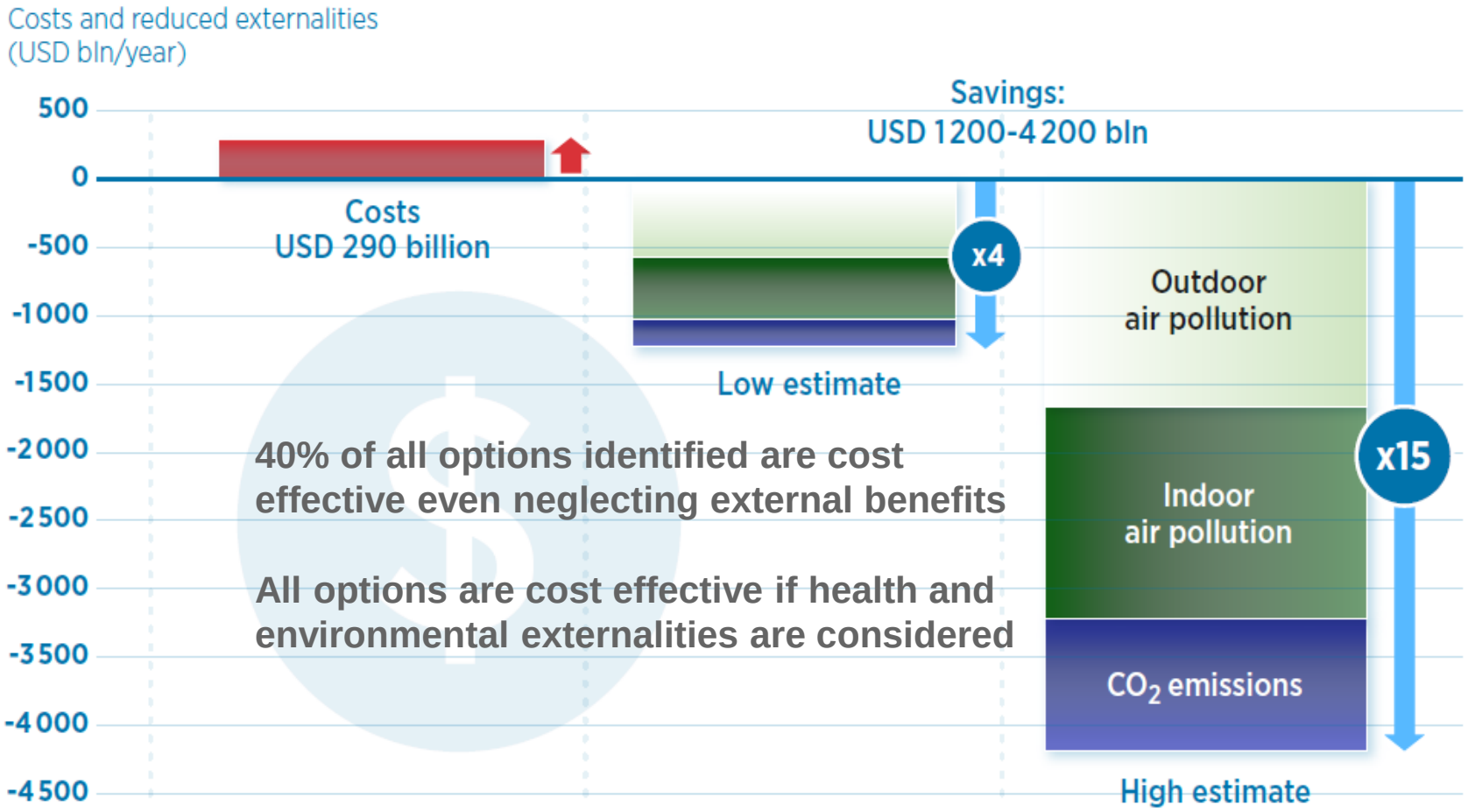
https://sustainabledevelopment.un.org/sdgs

Renewables as Largest Primary Energy Source



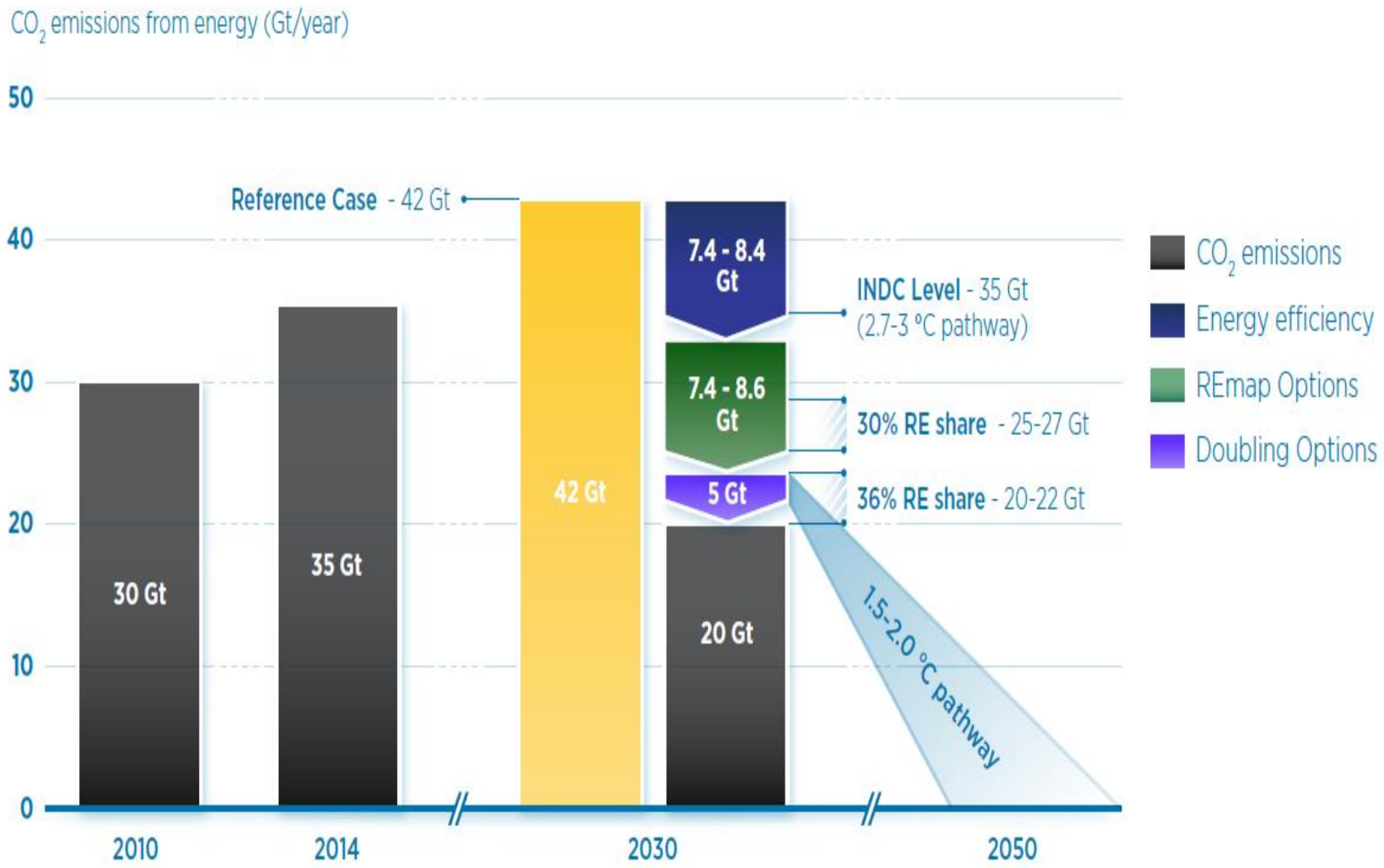
Renewables would mainly replace coal to become the largest source of primary energy by 2030 in the REmap scenario.

Savings greatly exceed costs



Savings from reducing human health damage and CO_2 emissions would be 4 to 15 times the cost of the doubling renewable share

RE Doubling Needed to Limit Temperature Rise to 1.5-2.0ºC



Benefits of a doubling

Limit average global temperature rise to **2 °C** or below (when coupled with energy efficiency)

Avoid up to **12 gigatonnes** of energy-related CO_2 emissions in 2030

24.4 million jobs in the RE sector by 2030, compared to 9.2 million in 2014

Reduce air pollution enough to save up to **4 million lives** per year

Boost global GDP by up to **$ 1.3 trillion**

Updated REMAP Cost Curve with Health and Environment

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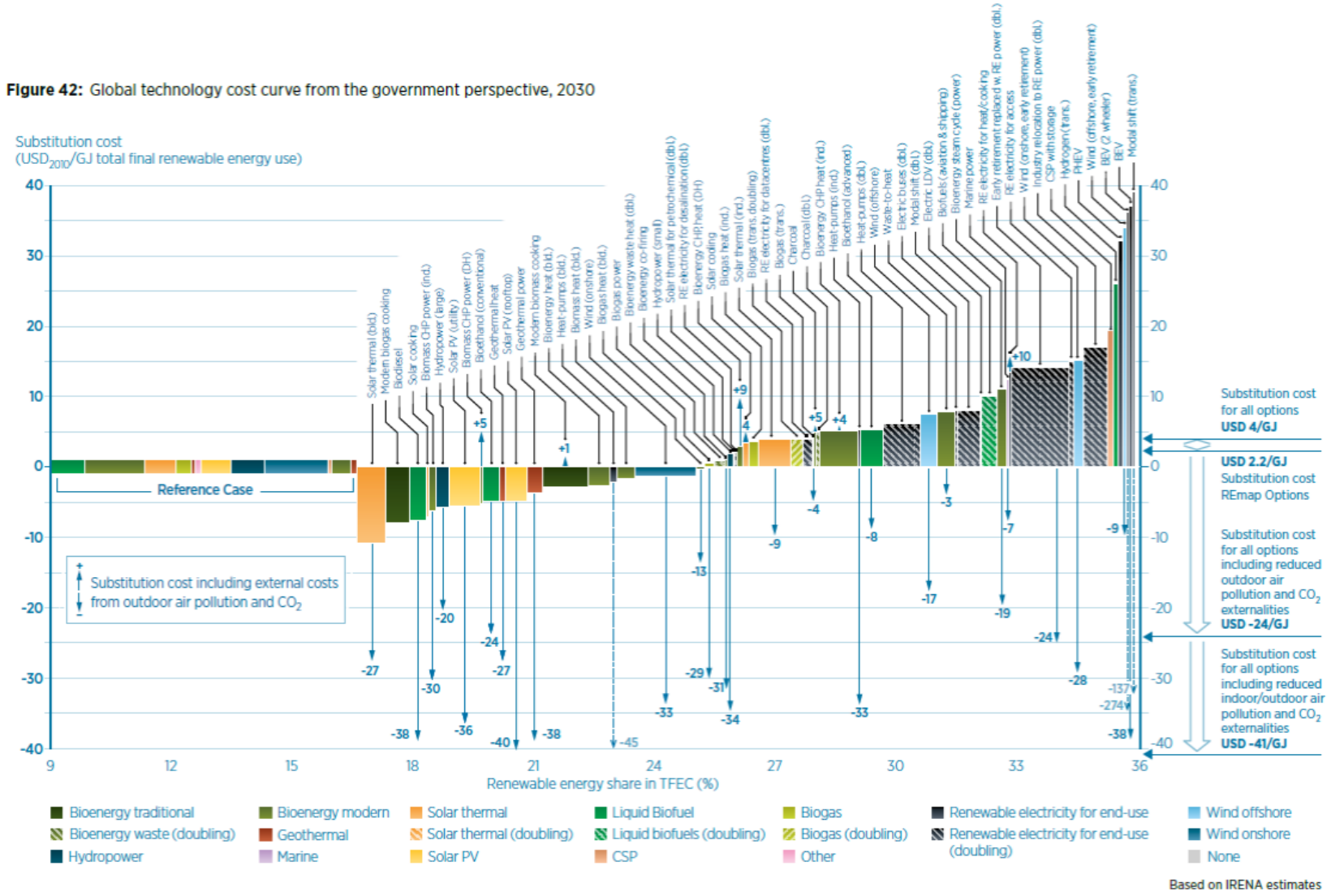
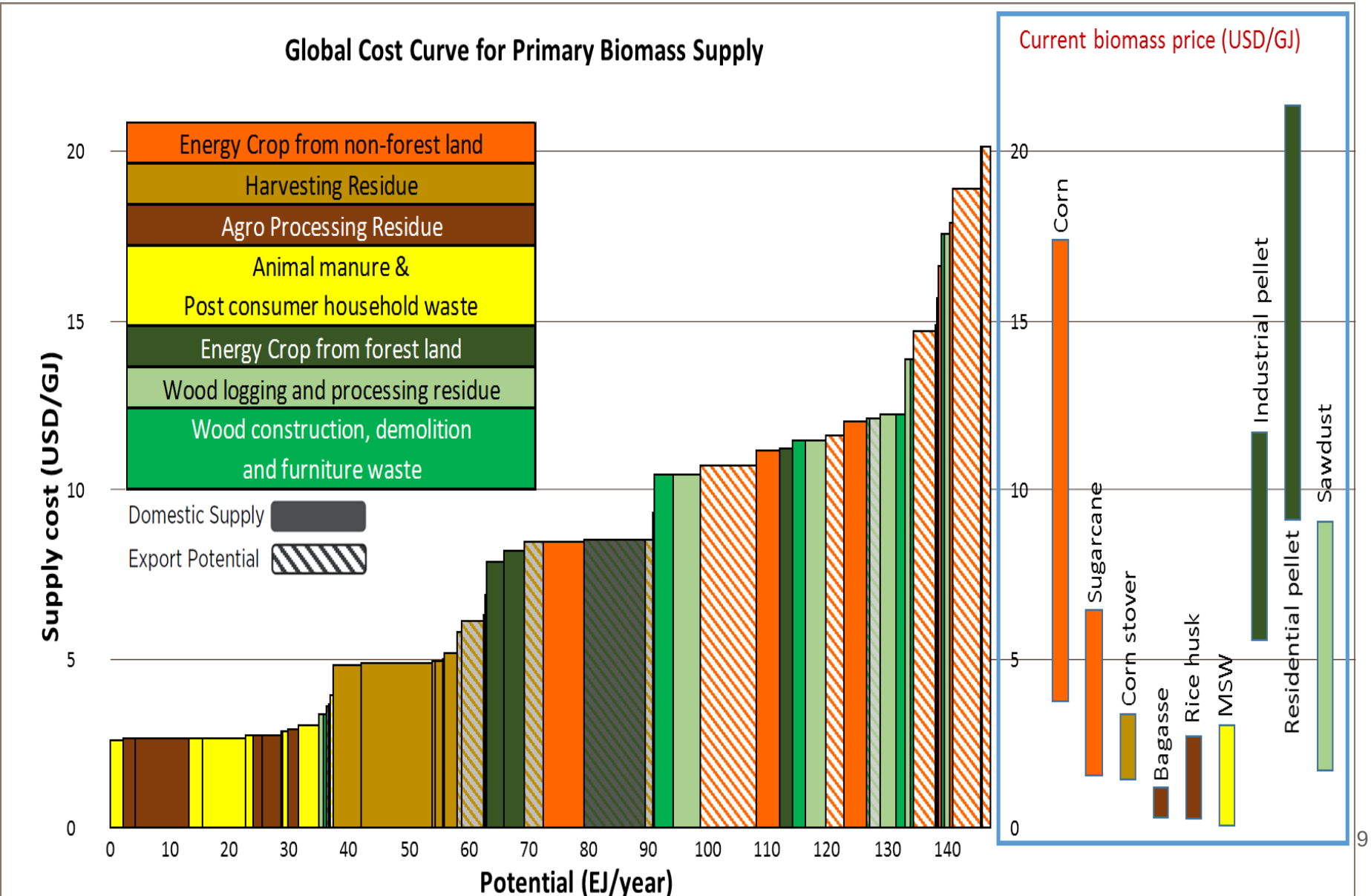
Figure 42: Global technology cost curve from the government perspective, 2030

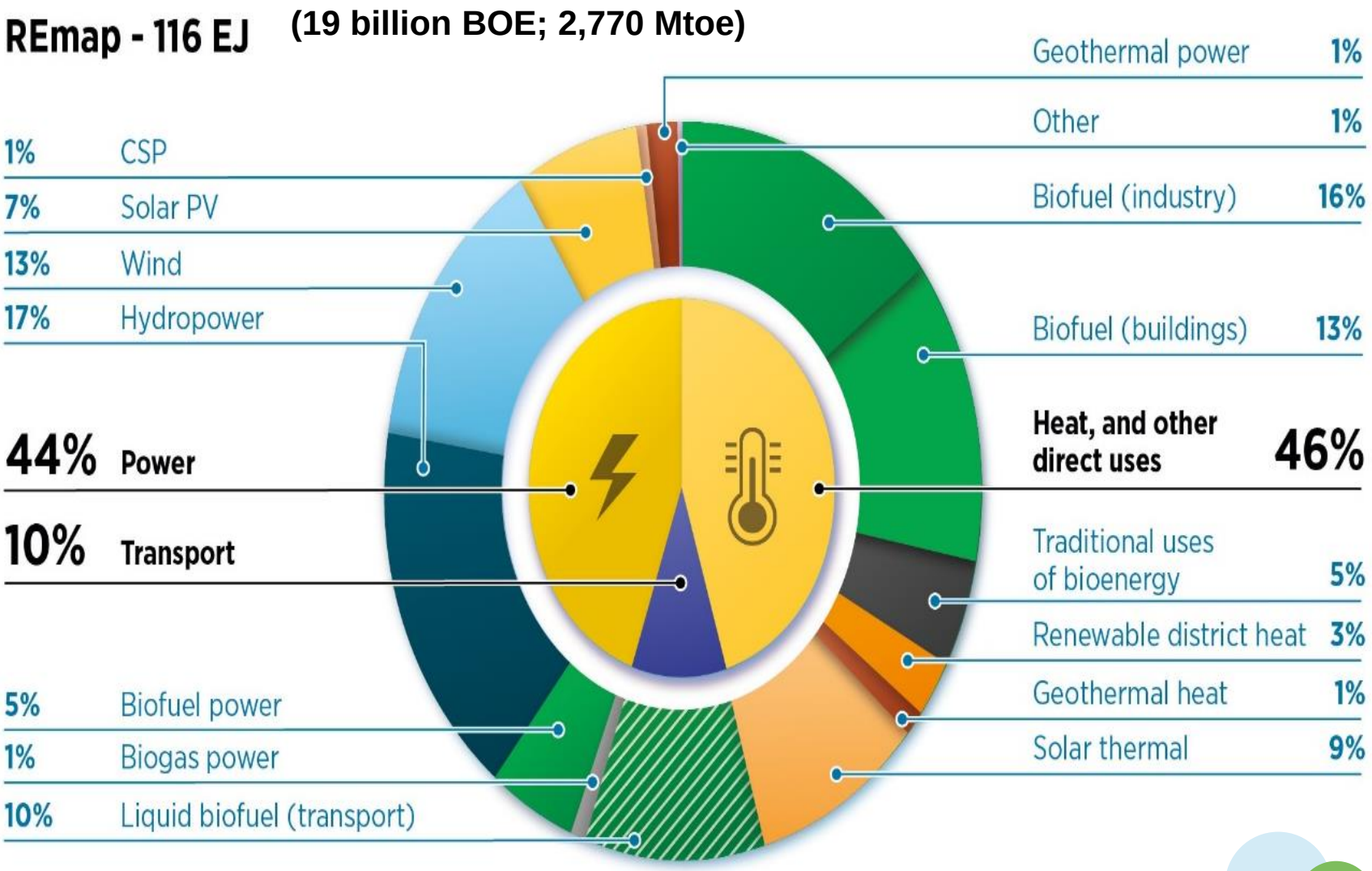


Based on IRENA estimates

Biomass Supply Curve (REmap 2030)



Expanding RE in All Sectors



Modern Biomass May More than Triple

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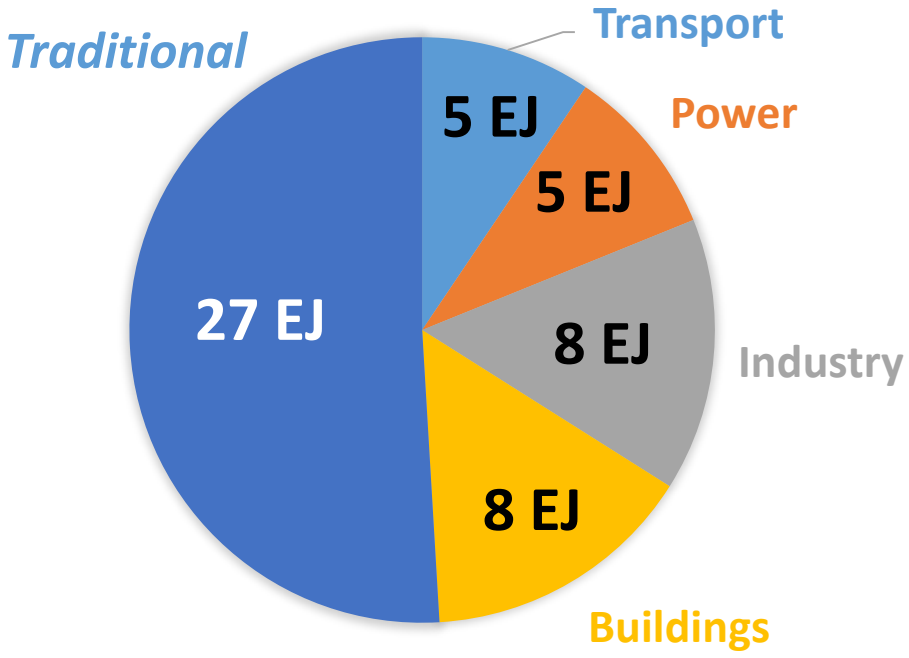
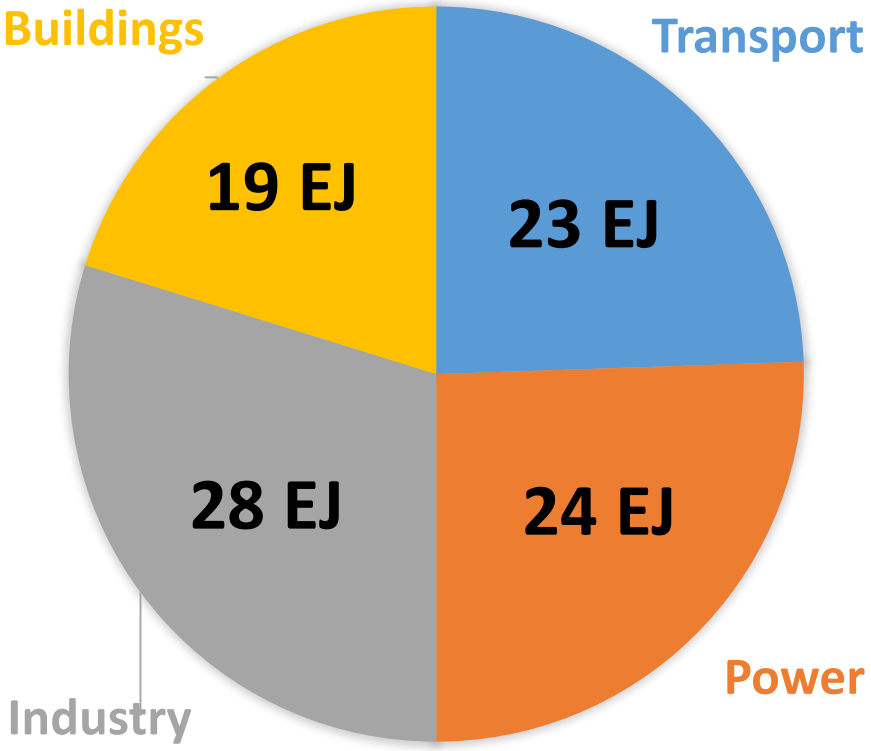
26 EJ in 2010



94 EJ in 2030



Challenges to Bioenergy

- Social: Food vs Fuel
- Environmental: Land Use Change
- Economic: Low Price of Oil

Meeting the Challenges

- Social: Food vs Fuel
  - Sustainable intensification: higher yields
  - Allows to produce more food AND fuel.
- Environmental: Land Use Change
  - Sustainable intensification: energy crops
  - Keep forest as forest, grassland as grassland
  - Convert degraded land to productive use
- Economic: Low Price of Oil
  - Efficient use of biomass for cooking, heat, power
  - Competition not mainly with oil in these sectors
  - Count value of reducing atmospheric pollutants

Pockets of Sustainable Bioenergy

- Agriculture
  - Residues associated with growing food production
  - Higher yields on cropland (sustainable intensification)
  - Efficient livestock husbandry: freeing up pastureland
  - Reduced food losses and waste: freeing up farmland
- Forestry
  - Residues (complementary fellings on timberland)
  - Higher yields in planted forests (better management)
  - Afforestation of degraded forest and marginal lands
- Algae

Residues from Expanding Food Supply

- Two main types of agricultural residues
  - Harvest residues (sustainably collect 25% - 50%)
  - Processing residues (practically collect 90% or more)
- Potential for biofuels from the residues
  - 79 to 128 EJ of agricultural residues collectable by 2050
  - 33 EJ of residue projected to be needed for animal feed
  - 46 to 95 EJ remaining available for conversion to biofuel
  - 40% efficient process for converting lignocellulose
  - 18 to 38 EJ of advanced biofuel could be produced
  - (22 EJ used for marine shipping and aviation in 2012)

Yield Gap: Illustrated by Maize

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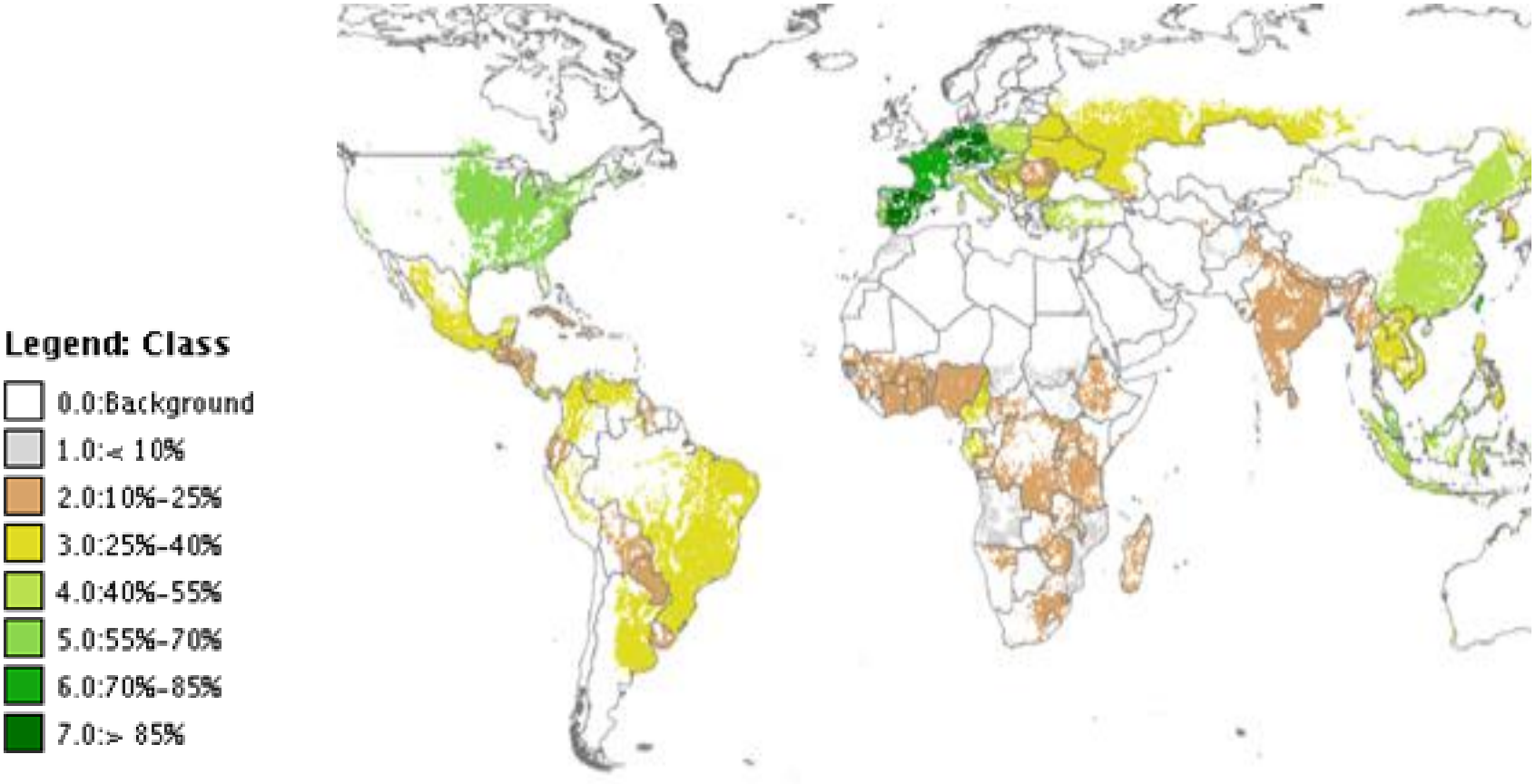
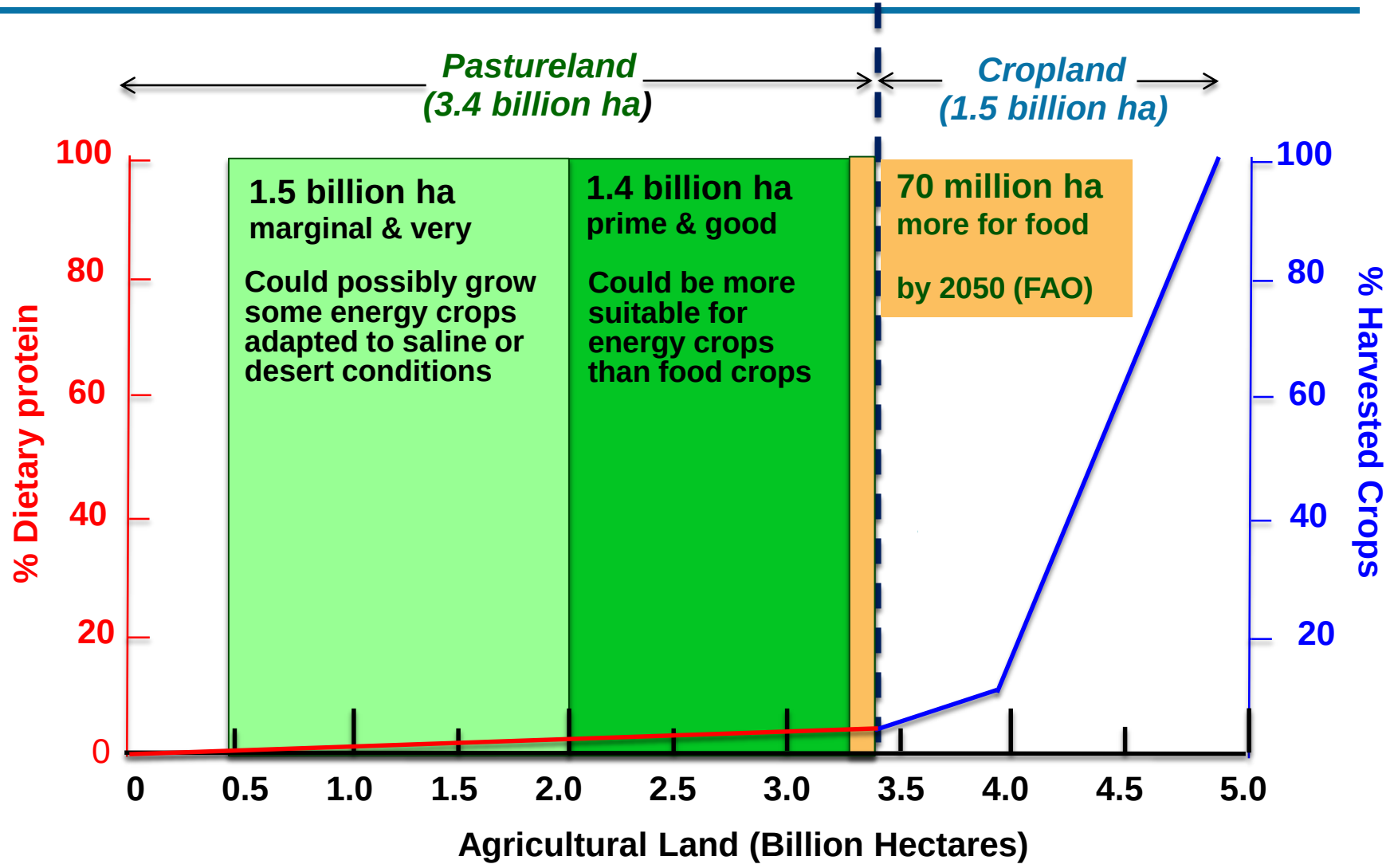
Ratio of Actual to Potential Yield for Maize (Year 2000)



Source: Global Agro-Ecological Zones

Pastureland Available Globally for Biofuel Crops



Best Practice Losses by Food Chain Stage

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Food Type	Agricultural Production	Postharvest Handling & Storage	Processing and Packaging	Distribution: Supermarket Retail	Consumption
Cereals	2%	2%	3.5%	2%	1%
Roots & Tubers	6%	7%	10%	3%	2%
Oilseeds & Pulses	6%	0%	5%	1%	1%
Fruits & Vegetables	10%	4%	2%	8%	5%
Meat	2.9%	0.2%	5%	4%	2%
Milk	3.5%	0.5%	0.1%	0.5%	0.1%

Forest Landscape Restoration

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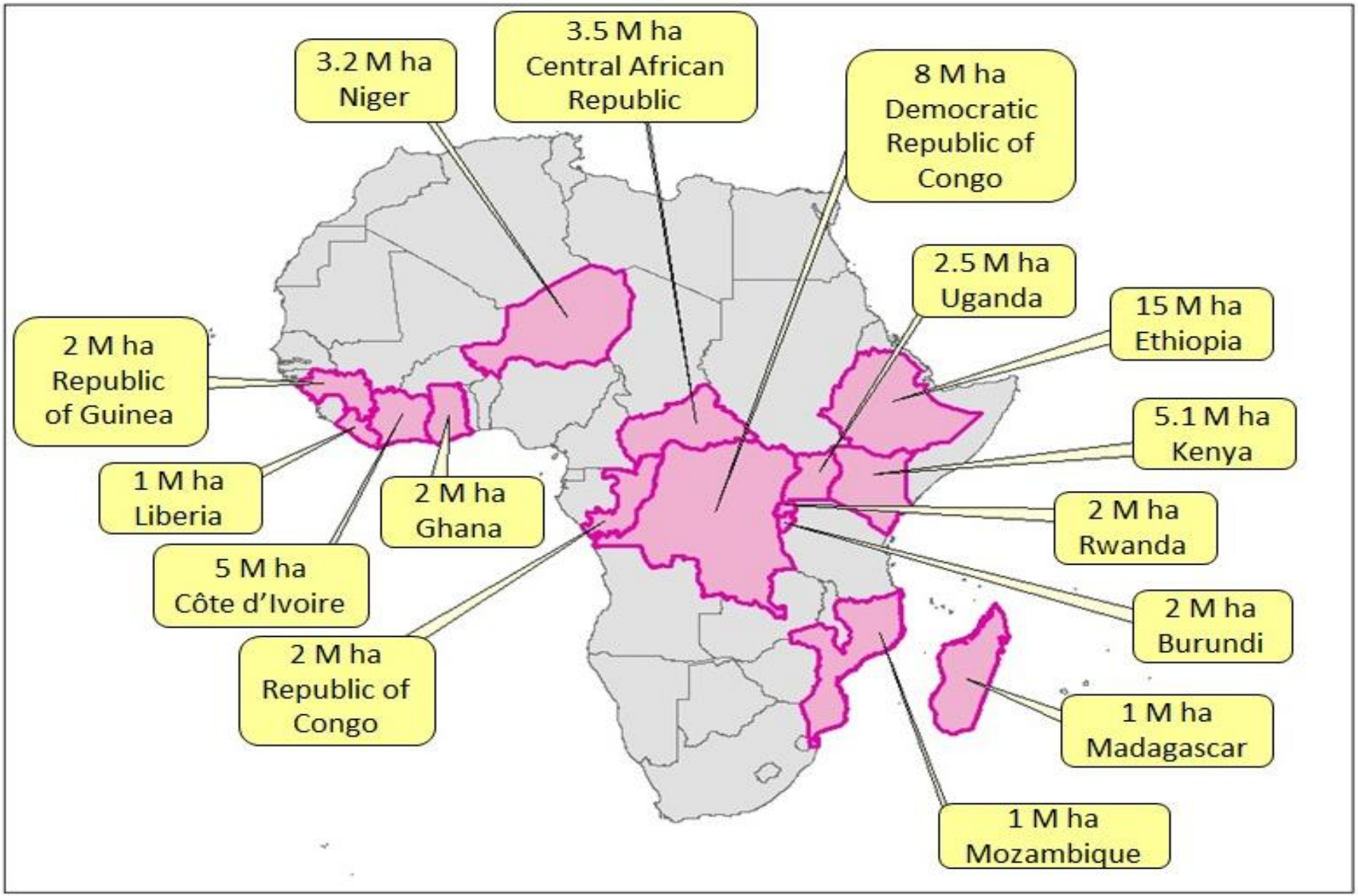

Potential Land for Solid Biomass

- **Closing the Yield Gap: 550 M ha**
- **Better Use of Pasture Land: 950 M ha**
- **Reduced Food Chain Losses: 270 M ha**
- **Forest Landscape Restoration: 350 M ha**
- **TOTAL: OVER 2 BILLION HECTARES, 300 EJ**

Wood Focus: Planted Forest Model

- Harvest Most Wood As Long-Lasting Lumber
  - Strong land tenure allows long-run investment
  - About two-thirds of wood extraction as lumber
    - Far more valuable than energy wood
    - Lasts up to a century, sequestering carbon
    - Displaces carbon-intensive concrete
- Use Wood Residues for Heat and Power
  - Highly efficient (80-90%) combined heat and power, district heating systems, home furnaces
  - Displaces carbon-intensive fossil fuel

Wood Focus: Short Rotation Model

- Harvest Most Wood from Fast-Growing Trees
  - Traditional land tenure may well suffice.
  - Compatible with agro-forestry approaches.
  - Carbon uptake and release in balance.
- Use Wood Residues for Cooking, Heat and Power
  - Highest priority use in modern cookstoves
    - Reduced indoor pollution
    - Reduced wood collection time
    - Reduced pressure on local forests
  - Efficient heat and power uses as with forest wood

Policies to Boost Wood-Based Energy

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- ***Accelerate improvement of crop yields*** by expanding extension services to spread modern farming techniques.
- ***Reduce waste and losses*** in the food chain through better labeling, public information, refrigeration and infrastructure.
- Improve the ***efficiency of land use for raising livestock***.
- Collect ***comprehensive data*** on land that could be used for cultivation of ***wood species***, including likely yields.
- Conduct in-depth research on ***practices for cultivating short-rotation tree crops*** on different types of land.
- Institute ***more secure land tenure*** and ***better governance*** to provide incentives for more intensive land management.
- Provide incentives to plant ***trees on degraded lands.***

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BOOSTING BIOFUELS

Sustainable Paths to Greater Energy Security

Global Bioenergy

SUPPLY AND DEMAND PROJECTIONS

A working paper for REmap 2030