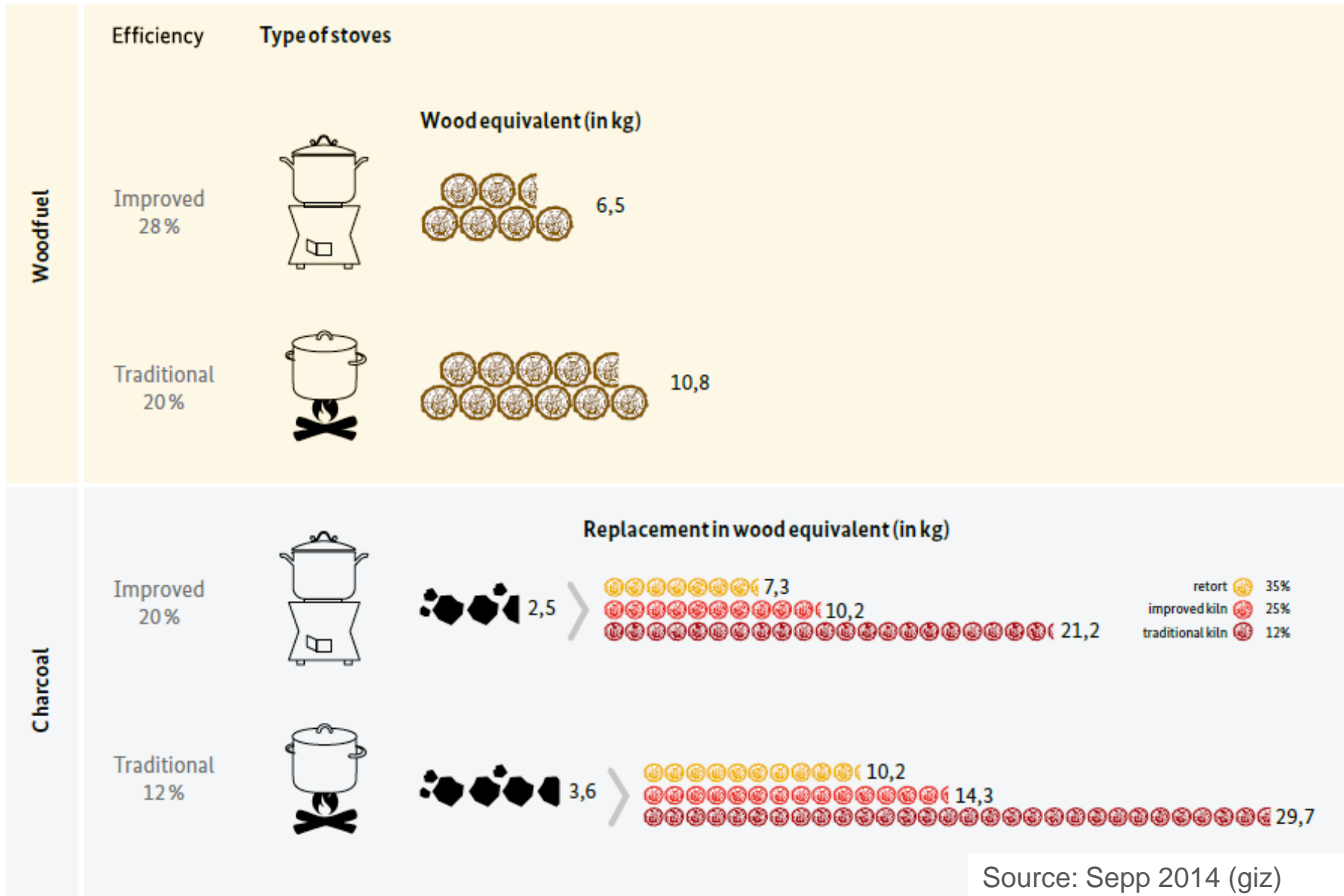


1 Kg of LPG (liquid petroleum gas) is approx. equivalent to 6.5 to 30 kg of traditional biomass:



Source: Sepp 2014 (giz)

Biomass for bioenergy: Outline

- What?
- Why?
- Which crops preferable?
- Current sources
- **What are future sources?**
- Examples
- Discussion
- Resources for more information

What are future sources of biomass for bioenergy?

Pop quiz



Photo credit: Ron Savage <http://sierravistaimages.zenfolio.com/>

Q: What are future sources of biomass for bioenergy?

A: Lots more of the same in near term



Options exist that, if developed with care, could contribute to enhanced food AND energy security



Photo credit: Ron Savage
<http://sierravistaimages.zenfolio.com/>

Projections of future biomass resources depend on targets → wide range of estimates:

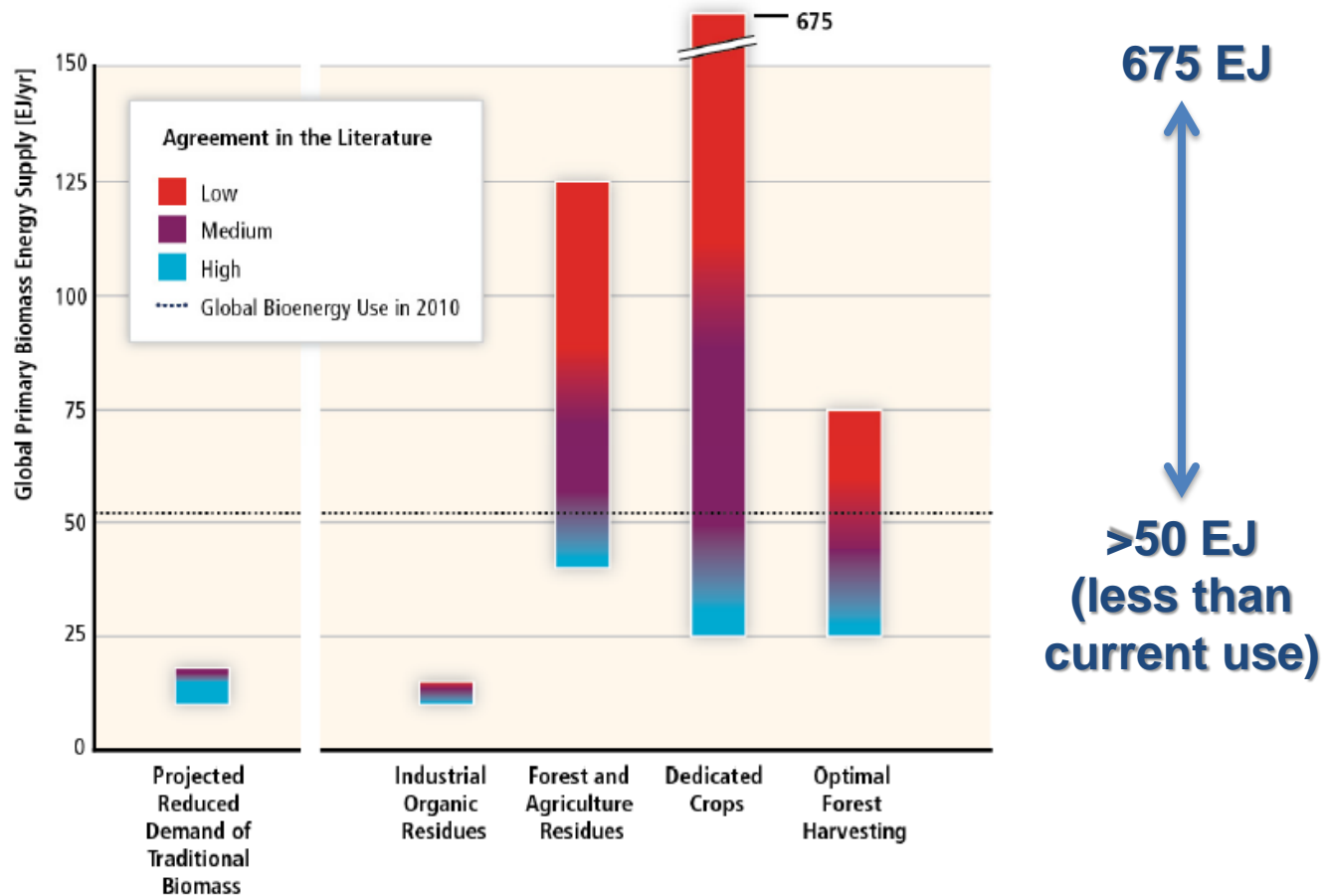
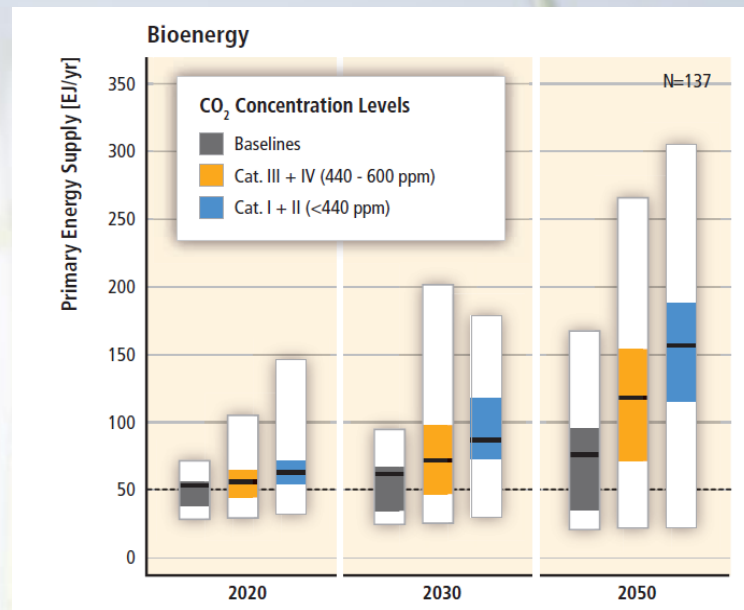


Figure 11.20. Global Technical Bioenergy Potential by main resource category for the year 2050. The figure shows the ranges in the estimates by major resource category of the global technical bioenergy potential. The color grading is intended to show qualitatively the degree of agreement in the estimates, from blue (large agreement in the literature) to purple (medium agreement) to red (small agreement). In addition, reducing traditional biomass demand by increasing its use efficiency could release the saved biomass for other energy purposes with large benefits from a sustainable development perspective.

Why do global biomass potential estimates vary so much?

- “Technical Potential”
750-1500 EJ per year (Smeets et al. 2007)
- “Sustainable potential”
300-500 EJ per year
- Dornburg et al. 2010
- “Conservative potential”
 - “impossible that bioenergy could physically provide more than 250 EJ /yr in 2050” -Haberl et al. 2013 (Environ. Res. Lett. 8)



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Assumptions about land available without impacting food security are key to estimates.

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“most likely range is 80-190 EJ” but estimates depend on land assumptions

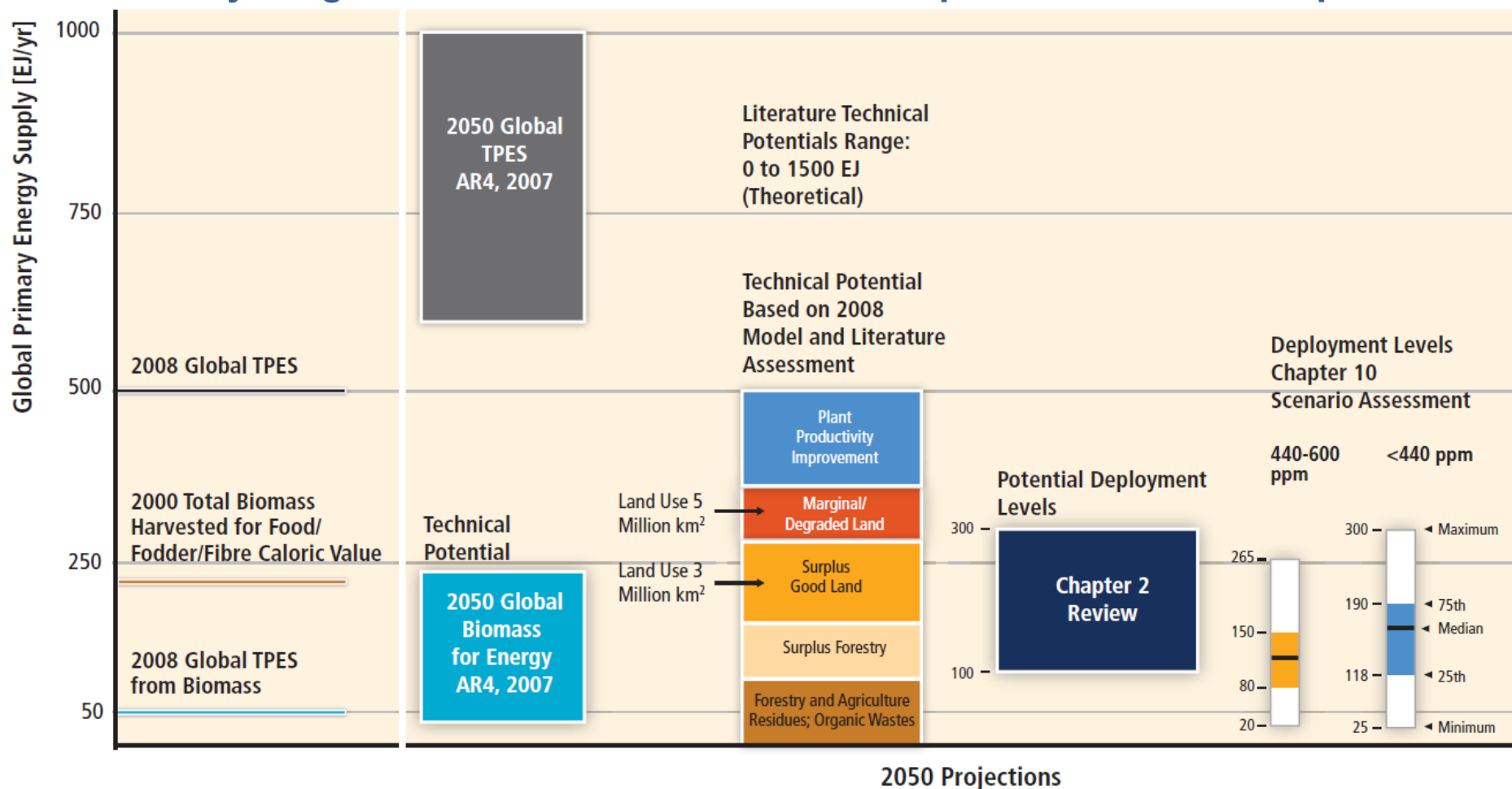


Figure 2.25 | On the left-hand side, the lines represent the 2008 global primary energy supply from biomass, the primary energy supply, and the equivalent energy of the world’s total harvest for food, fodder and fibre in 2000. A summary of major global 2050 projections of primary energy supply from biomass is shown from left to right:

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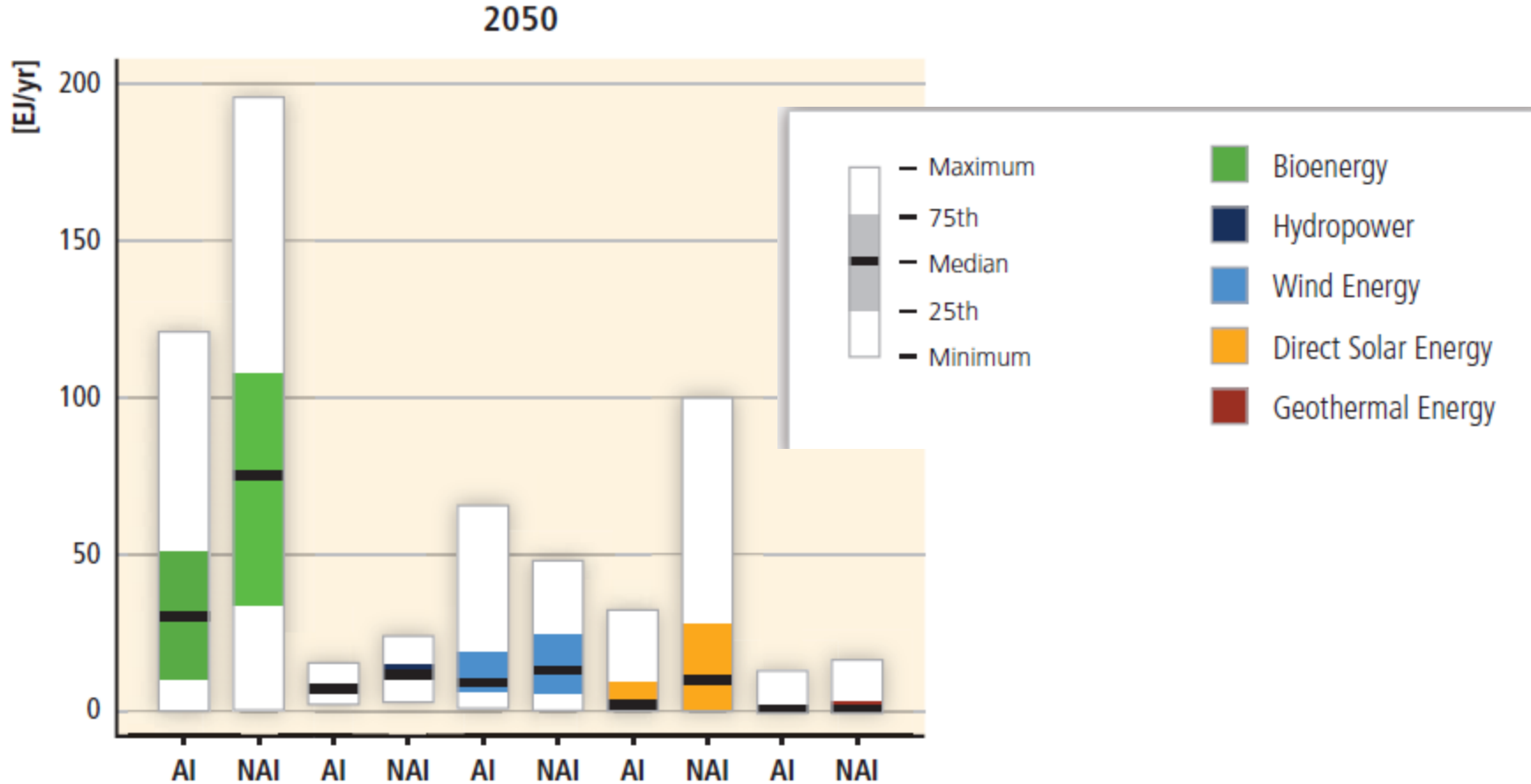
Future biomass for bioenergy sources must address perceived obstacles

- **Markets: lack of security for investment in increased production**
- **Food security and land concerns**
- **LUC-related effects on biodiversity, carbon debt, water**
- **Distribution of benefits and costs**
- **Need for integrated policy across agriculture, forestry, waste management, urban planning, environment, energy...**
- **Sector- and nation-specific challenges: e.g., policies, “blend wall,” distribution infrastructure**

Source: Kline presentation to “Pathways to Climate Solutions: Assessing Energy Technology and Policy Innovation” Workshop organized by the Aspen Global Change Institute; 24-28 February, 2014. Aspen CO.

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To achieve climate mitigation scenarios – BIOENERGY has important role relative to other potential renewable energy sources.



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So we should figure out how to do it right! (more sustainably)