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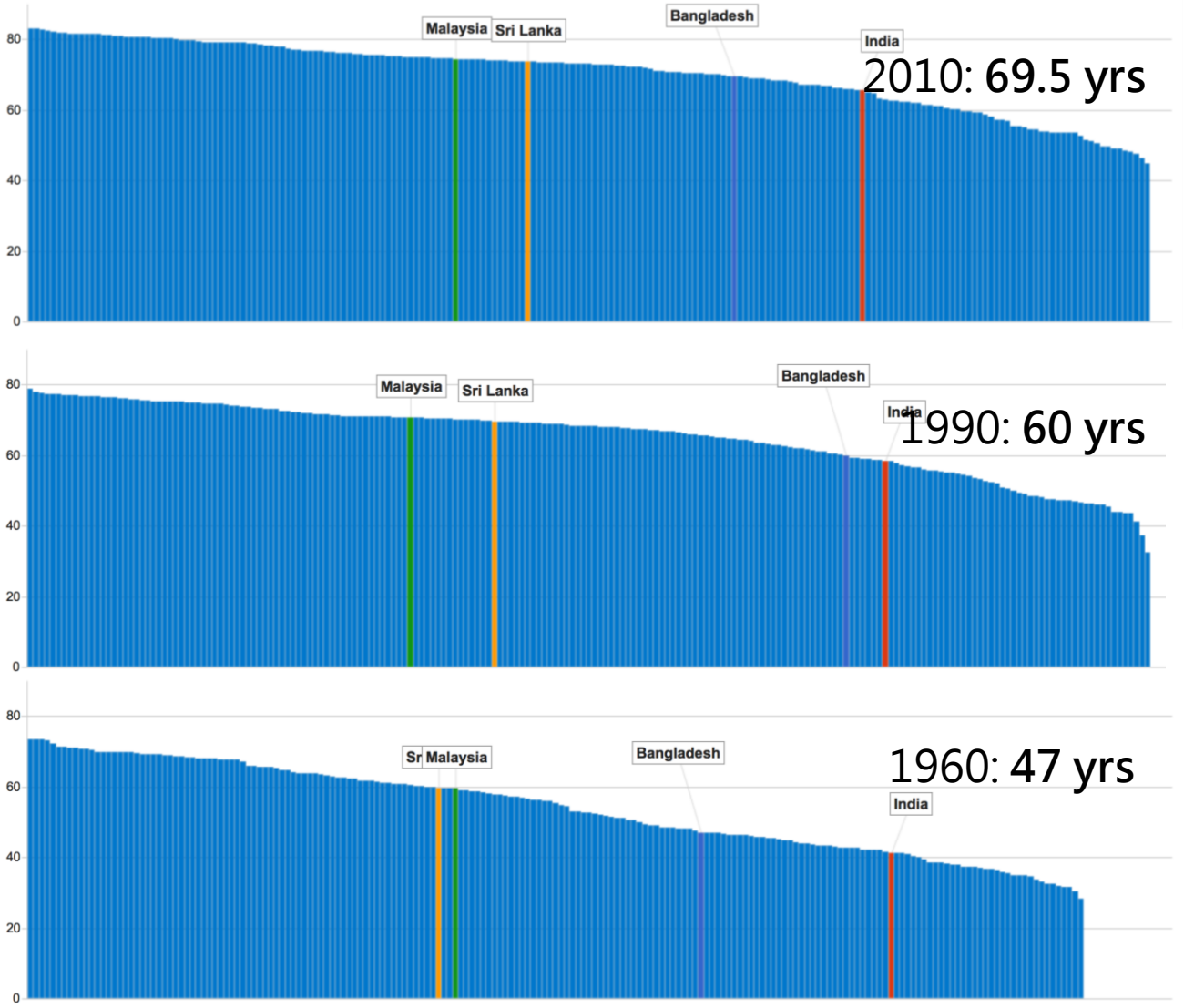
Food: What to model?



Life expectancy increased by 22.5 years in 50 years

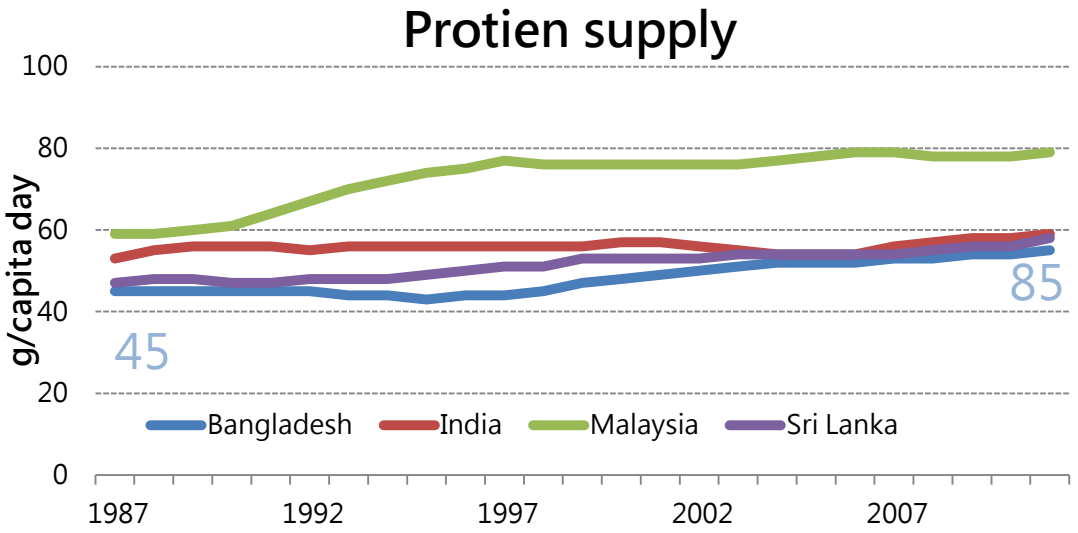
Factors for life expectancy:

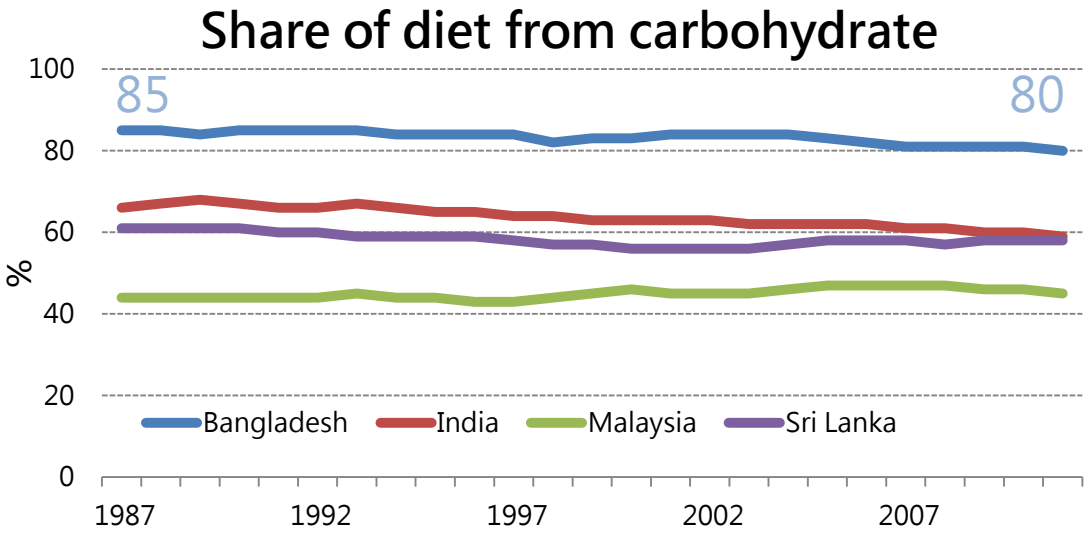
- **Food – diet**
- Education
- Healthcare investments

Food production conflicts with **bioenergy**

Nutrition and diet

Diet is changing!



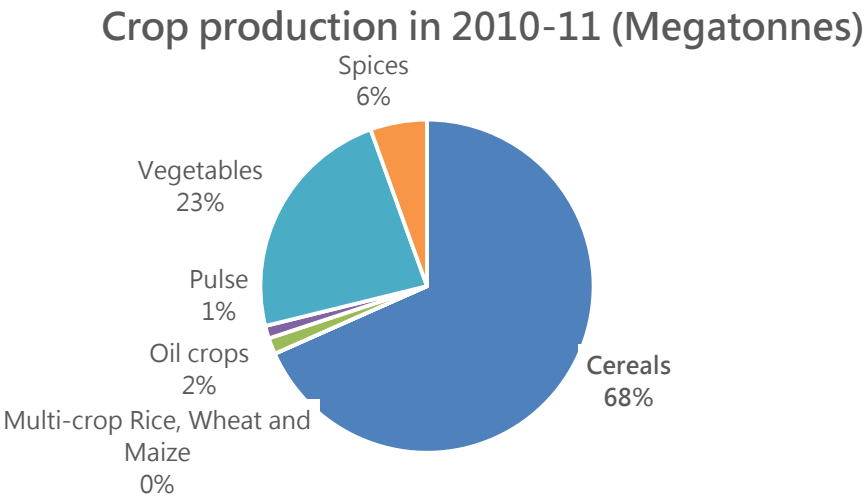


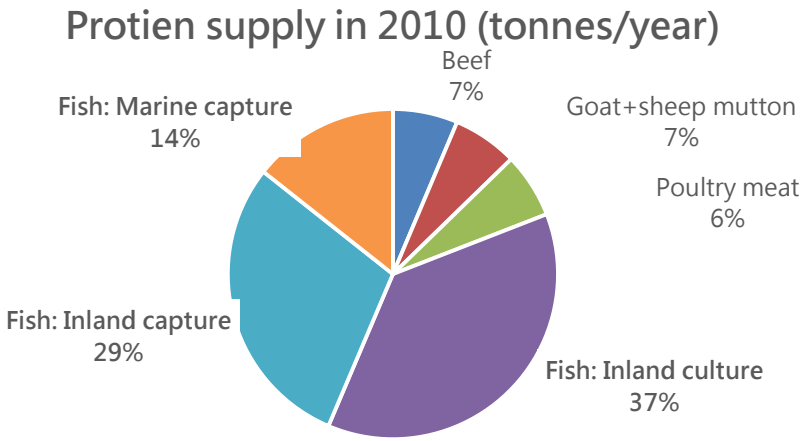
- Rice – primary source of diet
- Share of animal protein rising
- Agricultural land decreasing
- Farm productivity increasing

Average calorie intake per day
Rural: 2345 kCal
Urban: 2244 kCal
National: 2318 kCal

Recommended: 2400 kCal

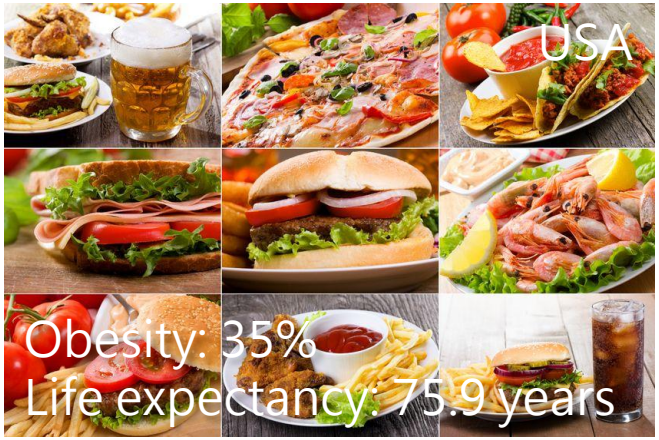
Crop production and protein source

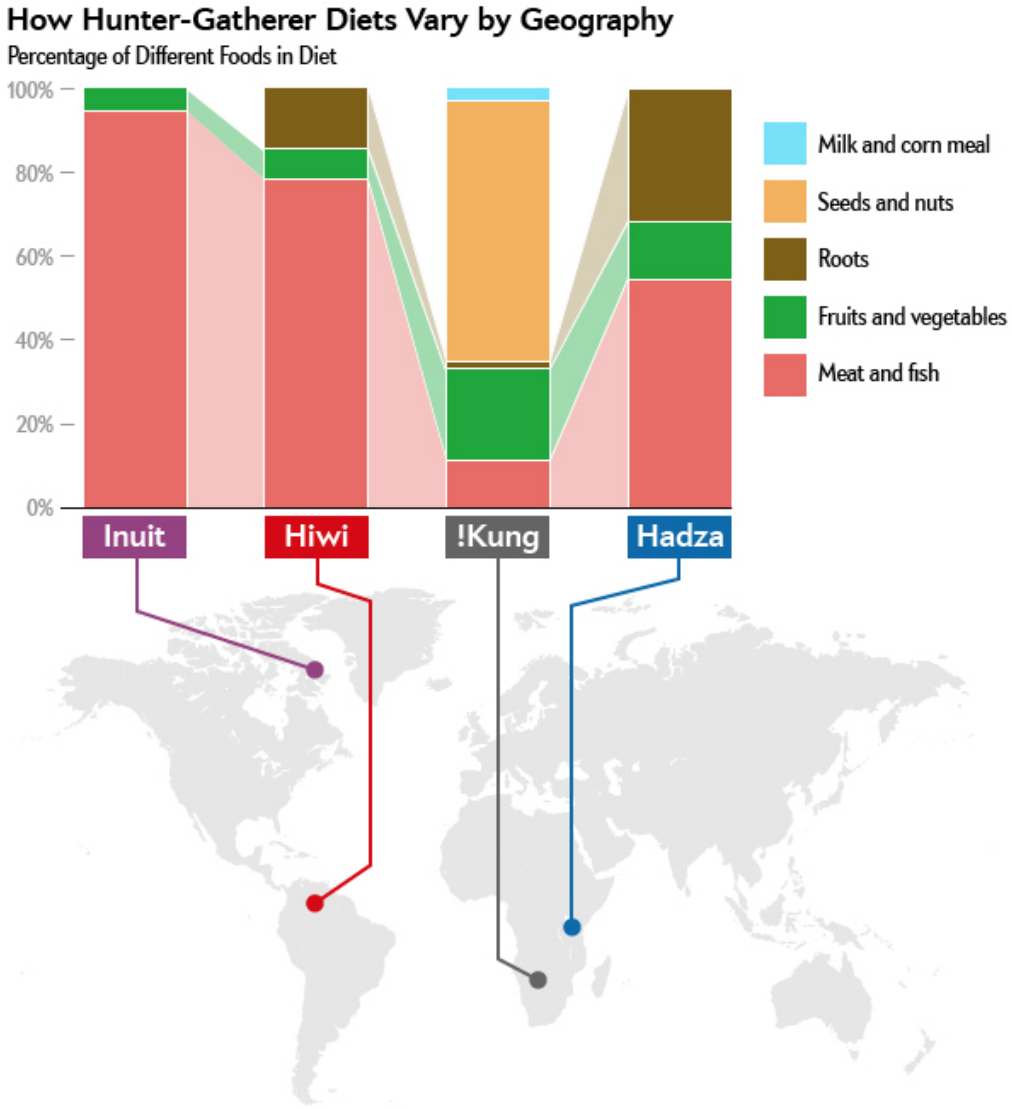




Evolutions of diet

Bangladesh





Changing diets are challenging!

THE INDEPENDENT WEDNESDAY 11 FEBRUARY 2015

Let them eat spuds: potatoes - the world's new staple?

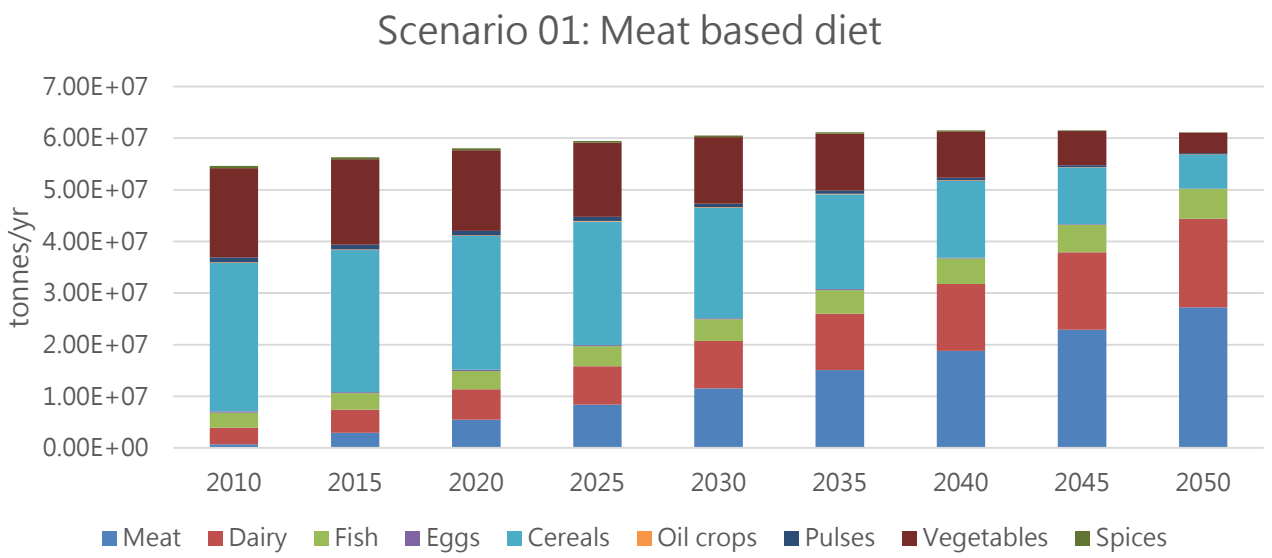
As the Bangladeshi army is ordered to march on potatoes rather than rice, Andrew Buncombe investigates whether the humble tuber, so popular in the West, can really help alleviate the global food crisis

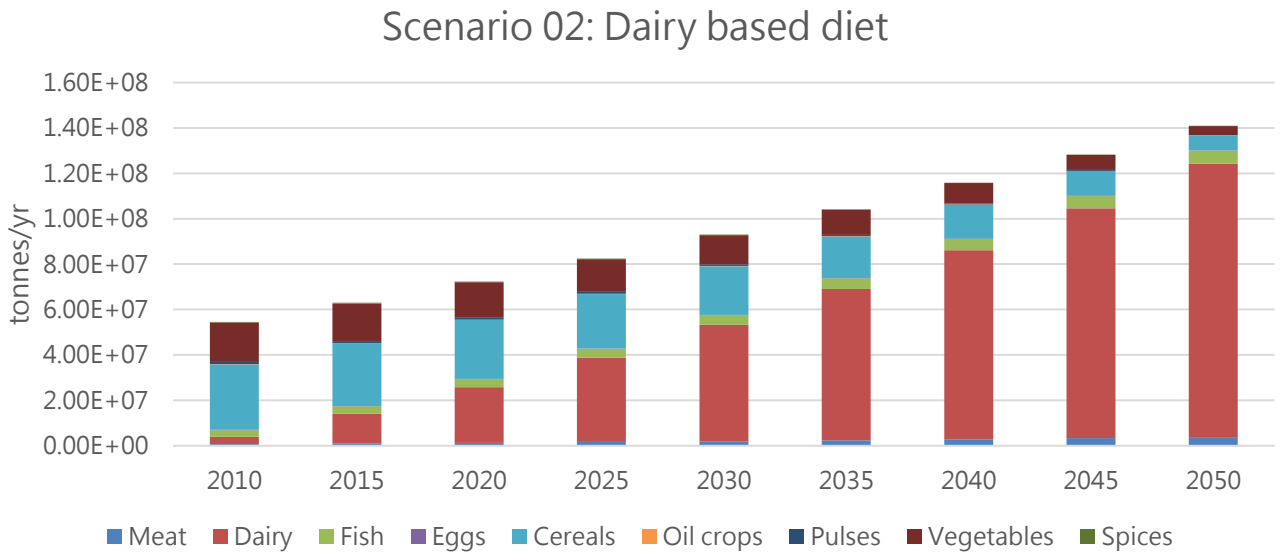
When the order came down from the top brass of Bangladesh's armed forces it sounded like a joke. Some of the soldiers and sailors who were told that from now on their daily rations would include increased servings of potatoes almost certainly did not take it seriously either.

Modelling methodology

Choices	• Protein source: **Meat**, **Dairy**, **Fish**, **Vegetarian** • Nutrition intake: L1: **2436** – L4: **2931** kCal by 2030 and **2931-3006** by 2050.
Landuse	Country areas divided into types suitable for various types of farming
Food demand	• Choices are translated into demand for food vectors • Local production exhausted first • Import "unmet" food demand
Food production	Productivity relies on: • Farm power index (mechanical vs. human) • Fertiliser use • Land availability (Bioenergy uses land first)
Food security	**Import** unmet demand

Food outputs






Bioenergy

Bioenergy from marginal land

- Level 1: Work already carried out by 2014: 73,000 ha marginal land as plantations, 45,000 ha Mangroves established.
- Level 2: 294,000 ha marginal land converted to plantations, 110,000 ha Mangroves established.
- Level 3: 867,000 ha marginal land converted to plantations, 369,000 ha Mangroves established and 286,000 ha wetlands used for Water Hyacinth
- Level 4: 1786,000 ha marginal land converted to plantations, 436,000 ha Mangroves established and 952,000 ha wetlands used for Water Hyacinth. This represents the conversion of all identified, non-agricultural land, an area of the size of the Sunderbans being planted out along the coastline and the majority of still water area in Bangladesh.

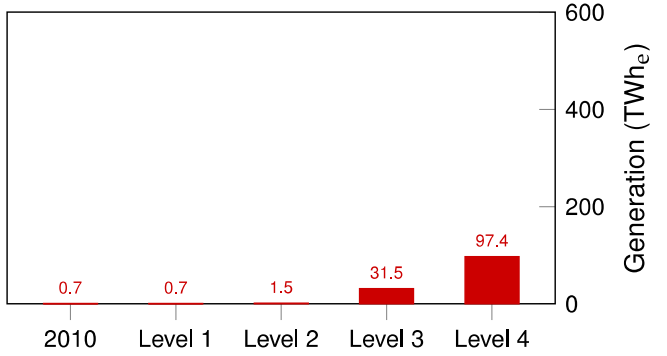


Figure 18.1: Projected in 2050, raw TWh before conversion

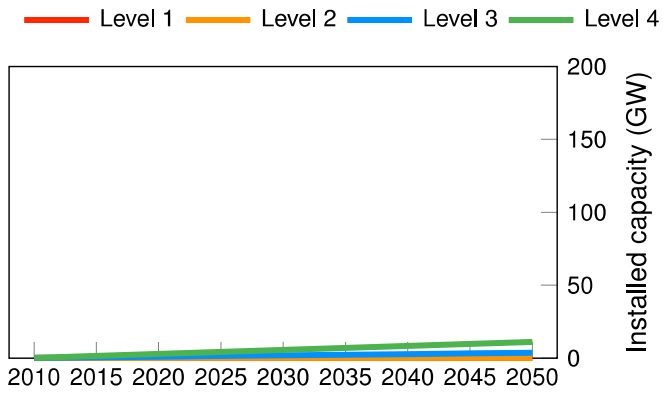


Figure 18.2: Development of capacity by scenario. Raw GWeq before conversion

Bioenergy from agricultural land

- Level 1: **No** area is allocated for growing biofuel crops.
- Level 2: **33%** of the available agricultural land is allocated to growing biofuel crops. This is a huge commitment, but possible with careful management.
- Level 3: **66%** of the available agricultural land is allocated to growing biofuel crops. By necessity, Bangladesh will be forced to import food at this point.
- Level 4: **100%** of the available agricultural land is allocated to growing biofuel crops. This is not exactly realistic, but provides an upper bound for the potential of bioenergy in Bangladesh.

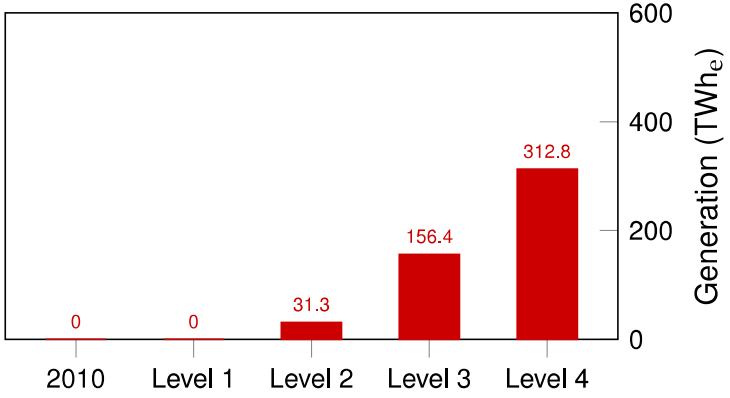


Figure 19.1: Projected in 2050, TWh liquid fuel

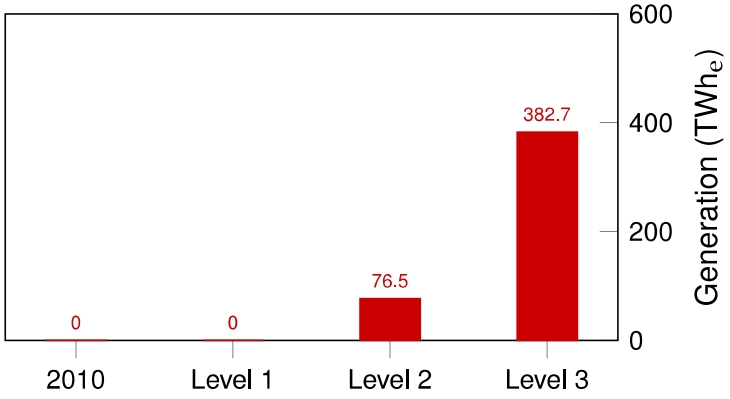


Figure 19.2: Projected in 2050, TWh raw residue

End-use of bioenergy

- Level 1: 70% of the dry and wet biofuels are converted to **solid fuels**, and 15% to Liquid and SNG respectively. All of the biogas is converted to SNG.
- Level 2: 70% of all biofuels are burnt or converted to fuel that can be burnt and use to generate **electricity** in biomass power stations. 10% is converted into Solid fuel, Liquid Fuel and SNG respectively.
- Level 3: 70% of all biofuels are converted to **liquid fuels** of various grades. 10% is converted into Solid fuel, Electricity and SNG respectively.
- Level 4: 70% of all biofuels are converted to **SNG**. 10% is converted into Solid fuel, Liquid Fuel and Electricity respectively.

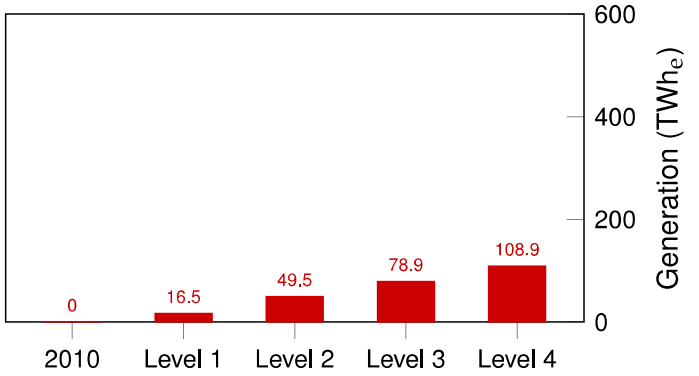


Figure 21.1: Projected in 2050, Raw biomass energy for a medium population

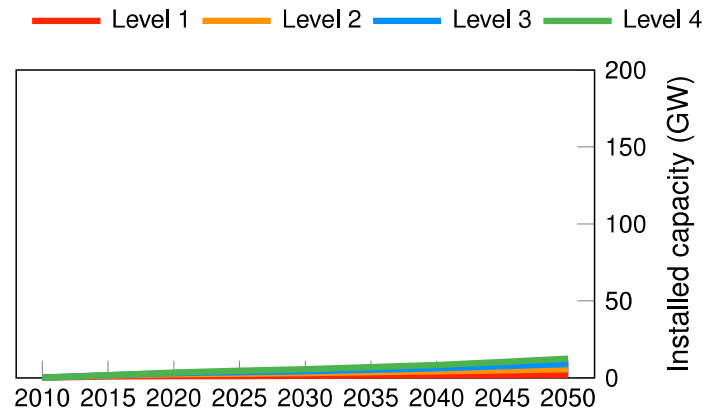
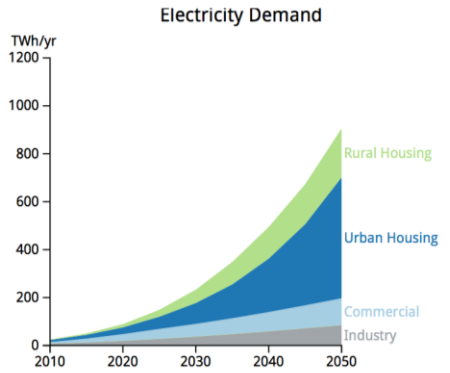
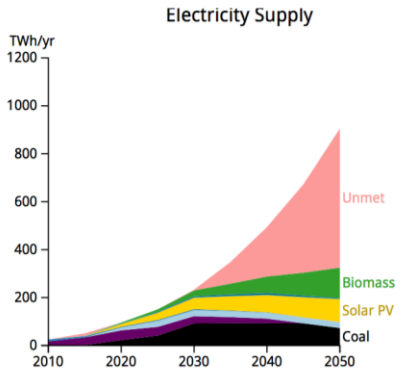
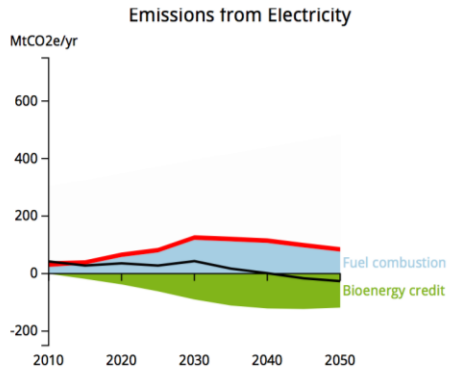
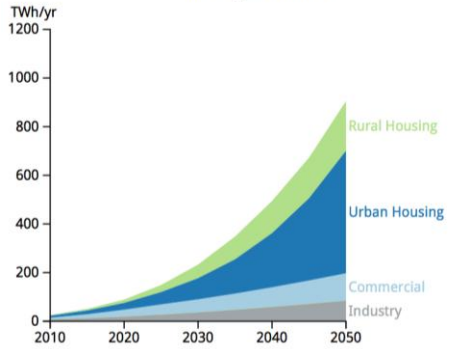


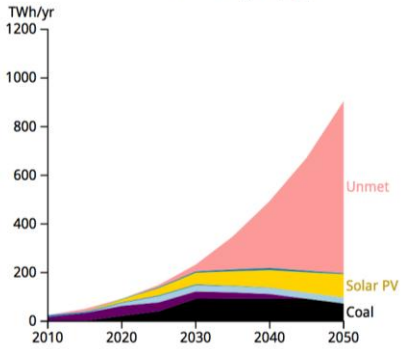
Figure 21.2: Raw Capacity before conversion, for a medium population growth

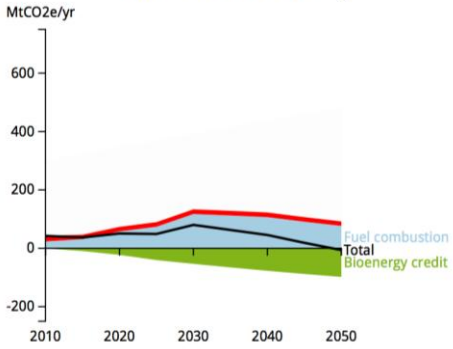


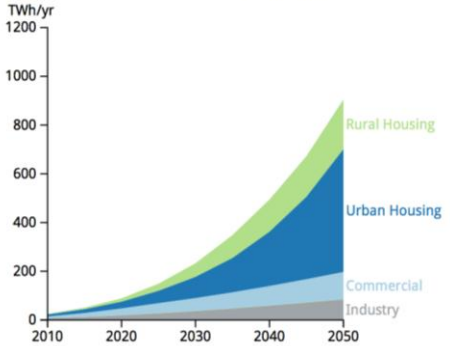


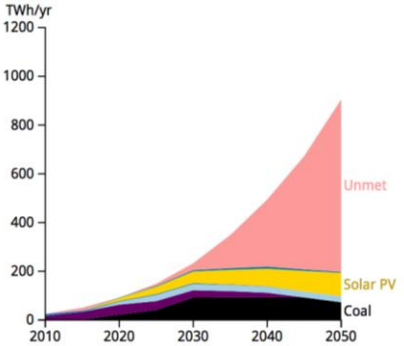


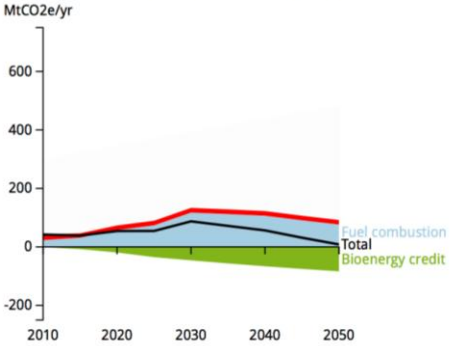












Biomass from 100% agricultural land

Biomass from marginal land – Level 4

No additional biomass


Thank you
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