

Katsaus IPCC SR15 raporttiin

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Esityksessä

- ▶ Ilmastonmuutokset vaikutukset lyhyesti
- ▶ Vaikutukset
- ▶ Päästövähennykset 1.5 asteeseen pääsemiseksi
- ▶ Mitä tarvitaan

Ennen IPCC SR15 raportin läpikäyntiä

- ▶ <https://areena.yle.fi/1-50007698>

Huom - katso ensimmäiset 30 sekuntia - ja sitten voit jatkaa tätä ppt-esitystä

IPCC SR15... Vaikutukset



Lisää tietoa -> riskit suurempia 1/2

- ▶ There are multiple lines of evidence that there has been a substantial increase since AR5 in the levels of risk associated with four of the five Reasons for Concern (RFCs) for global warming levels of up to 2 °C (*high confidence*).

Lisää tietoa -> riskit suurempia 2/2

- ▶ In “Unique and Threatened Systems” (RFC1) the transition from high to very high risk is located between 1.5°C and 2°C global warming as opposed to at 2.6°C global warming in AR5,
 - ▶ owing to new and multiple lines of evidence for changing risks for coral reefs, the Arctic, and biodiversity in general (*high confidence*)
- ▶ In “Distribution of impacts” (RFC3) a transition from moderate to high risk is now located between 1.5°C and 2°C global warming as compared with between 1.6°C and 2.6°C global warming in AR5,
 - ▶ due to new evidence about regionally differentiated risks to food security, water resources, drought, heat exposure, and coastal submergence (*high confidence*)
- ▶ In “Large scale singular events” (RFC5), moderate risk is located at 1°C global warming and high risks are located at 2.5°C global warming,
 - ▶ as opposed to 1.9°C (moderate) and 4°C global warming (high) risk in AR5
 - ▶ because of new observations and models of the West Antarctic ice sheet (*medium confidence*)

Lämpeneminen vaikuttaa jo

- ▶ **The global climate has changed relative to the preindustrial period with multiple lines of evidence that these changes have had impacts on organisms and ecosystems, as well as human systems and well-being (*high confidence*).**
 - ▶ The increase in global mean surface temperature (GMST), which reached 0.87°C in 2006-2015 relative to 1850-1900, has increased the frequency and magnitude of impacts (*high confidence*), strengthening evidence of how increasing GMST to 1.5°C or higher could impact natural and human systems (1.5°C versus 2°C)
- ▶ **Human-induced global warming has already caused multiple observed changes in the climate system (*high confidence*).**
 - ▶ In particular this includes increases in both land and ocean temperatures, as well as more frequent heatwaves in most land regions (*high confidence*).
 - ▶ There is also *high confidence* that it has caused an increase in the frequency and duration of marine heatwaves.

Sään ääri-ilmiöt lisääntyneet

- ▶ Changes in temperature extremes and heavy precipitation indices are detectable in observations for the 1991-2010 period compared with 1960-1979, when a global warming of approximately 0.5 °C occurred (*high confidence*).
- ▶ The observed tendencies over that time frame are consistent with attributed changes since the mid-20th century (*high confidence*)

Lajit kärsivät

- ▶ **Risks of local species losses and, consequently, risks of extinction (medium)**
 - ▶ The number of species projected to lose over half of their climatically determined geographic range (about 18% of insects, 16% of plants, 8% of vertebrates) is reduced by 50% (plants, vertebrates) or 66% (insects) at 1.5°C versus 2°C of warming (*high confidence*).
 - ▶ Risks associated with other biodiversity-related factors such as forest fires, extreme weather events, and the spread of invasive species, pests, and diseases, are also reduced at 1.5°C versus 2°C of warming (*high confidence*), supporting greater persistence of ecosystem services

Jäätön jäämeri

- ▶ There is *high confidence* that the probability of a sea-ice-free Arctic Ocean during summer is substantially higher at 2 °C when compared to 1.5 °C.
 - ▶ It is *very likely* that there will be at least one sea-ice-free Arctic summer out of 10 years for warming at 2 °C, with the frequency decreasing to one sea-ice-free Arctic summer every 100 years at 1.5 °C.
 - ▶ There is also *high confidence* that an intermediate temperature overshoot will have no long-term consequences for Arctic sea-ice coverage and that hysteresis behaviour is not expected
- ▶ **Sea level rise (medium)**
 - ▶ There is *high confidence* that sea level rise will continue beyond 2100.

Merien happamoituminen

- ▶ The ocean has absorbed about 30% of the anthropogenic carbon dioxide, resulting in ocean acidification and changes to carbonate chemistry that are unprecedented in 65 million years at least (*high confidence*).
 - ▶ Risks have been identified for the survival, calcification, growth, development, and abundance of a broad range of taxonomic groups (i.e. from algae to fish) with substantial evidence of predictable trait-based sensitivities.
 - ▶ Multiple lines of evidence reveal that ocean warming and acidification (corresponding to global warming of 1.5°C of global warming) is expected to impact a wide range of marine organisms, ecosystems, as well as sectors such as aquaculture and fisheries (*high confidence*)

Meret ☹️

- ▶ **Ocean ecosystems are experiencing large-scale changes, with critical thresholds expected to be reached at 1.5°C and above (*high confidence*).**
 - ▶ In the transition to 1.5°C, changes to water temperatures will drive some species (e.g. plankton, fish) to relocate to higher latitudes and for novel ecosystems to appear (*high confidence*).
 - ▶ Other ecosystems (e.g. kelp forests, coral reefs) are relatively less able to move, however, and will experience high rates of mortality and loss (**very high confidence**).
 - ▶ For example, multiple lines of evidence indicate that the majority of warmer water coral reefs that exist today (70-90%) will largely disappear when global warming exceeds 1.5°C (**very high confidence**)

Ruokaongelma

- ▶ **Global warming of 1.5 °C (as opposed to 2°C) is projected to reduce climate induced impacts on crop yield and nutritional content in some regions (*high confidence*).**
 - ▶ Affected areas include Sub-Saharan Africa (West Africa, Southern Africa), South-East Asia, and Central and South America.
 - ▶ A loss of 7-10% of rangeland livestock globally is projected for approximately 2 °C of warming with considerable economic consequences for many communities and regions

Päästöjä ja malleja

Päästöt ... 2030

- ▶ Pariisin lupaukset täysin riittämättömiä jo vuoteen 2030 mennessä
- ▶ 1.5 asteen tavoitteessa (ilman ylitystä)
 - ▶ päästöt vuonna 2030 25-30 GtCO₂e (eli n. -40-50% vrt 2010)
- ▶ Muuten joudutaan poistamaan hiilidioksiidia ilmakehästä laajamittaisesti joka on epävarmaa ja siihen liittyy selkeä riski.

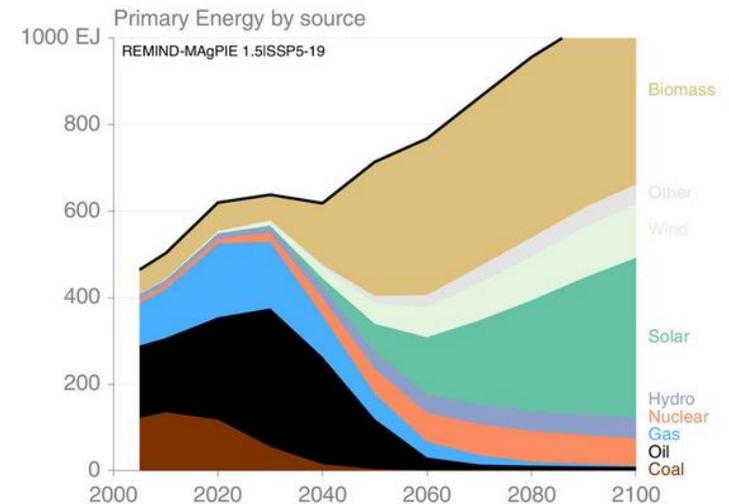
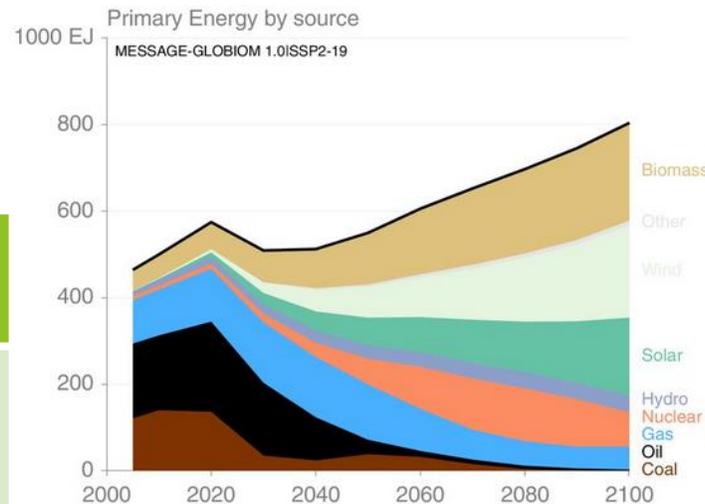
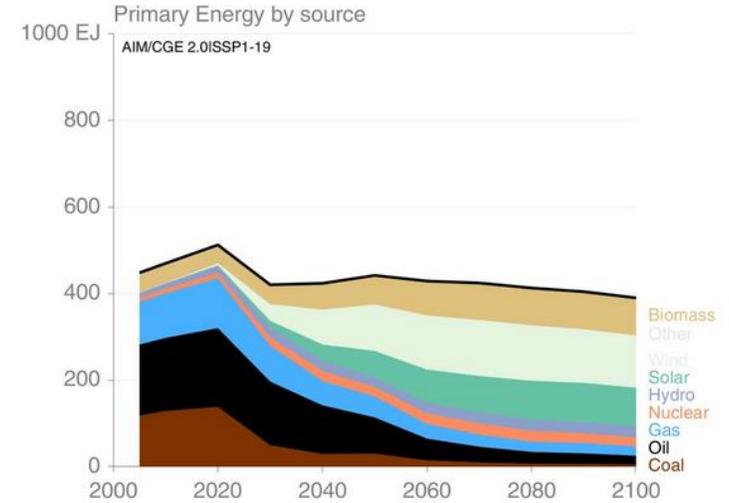
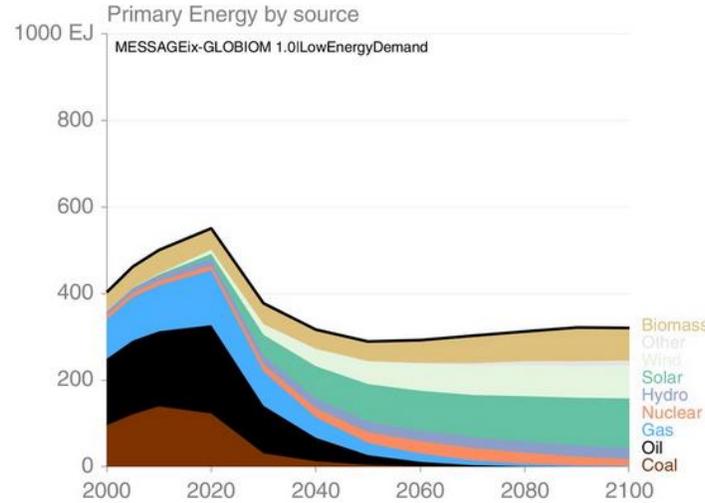
Päästöt 2030 ... 2050 ... 2100

- ▶ 1.5 astetta vaatii nettonolla CO₂-päästöt globaalisti 2050 JA samanaikaisesti merkittävät päästövähennykset esim metaanissa.
- ▶ Tämän saavuttamiseksi tarvitaan
 - ▶ Energiakulutuksen lasku
 - ▶ Vähäpäästöinen sähköntuotanto
 - ▶ Vähäpäästöiset muut polttoaineet
 - ▶ Energiankäytön sähköistäminen
 - ▶ Syvät päästövähennykset maataloudessa
 - ▶ Negatiivisia päästötekniikoita
- ▶ Matala energiankulutus ja pieni suuripäästöisten tuotteiden kysyntä on merkittävä osa 1.5 asteeseen pääsemiseksi.

Neljä erilaista skenaariota poliitikoille 1/2

► Hyvin erilaiset oletukset:

- Socioeconomic assumptions (SSP1, SSP2, SSP5)
- Total (primary) energy use
- Biomass
- Solar
- Nuclear
- Oil

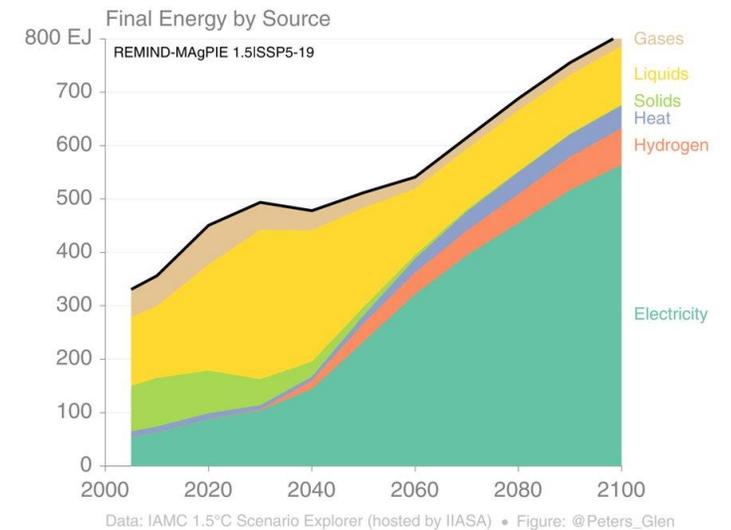
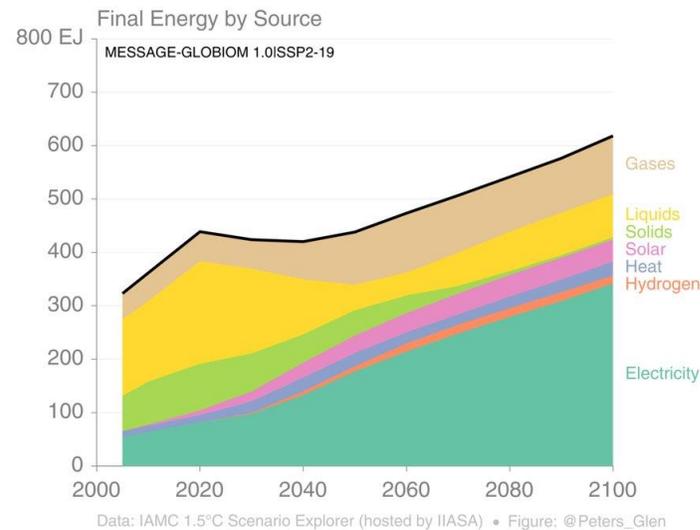
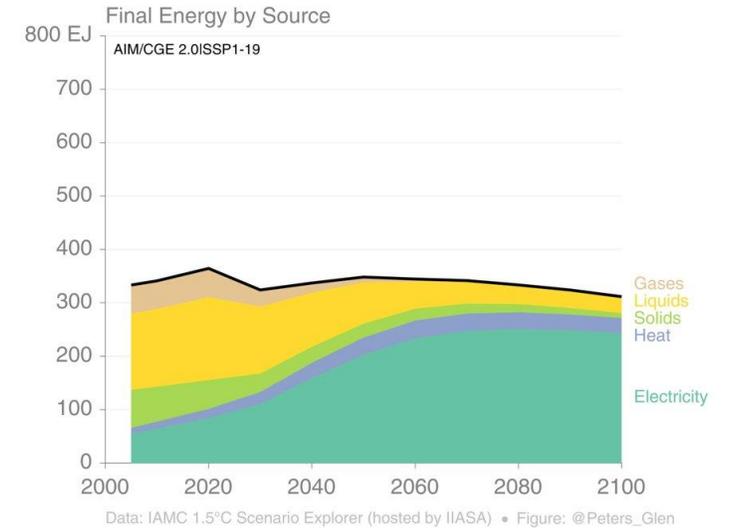
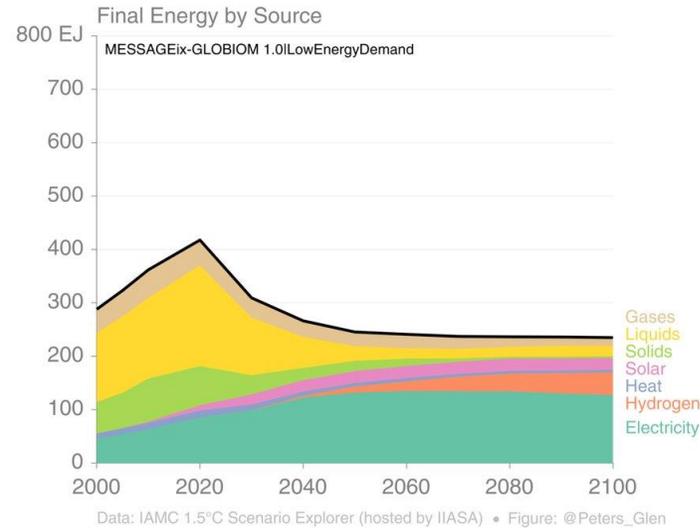


Skenaariot:

Eletään kiltisti 1	Eletään kiltisti 2
Normi skenaario	Länsimainen elämäntapa leviää

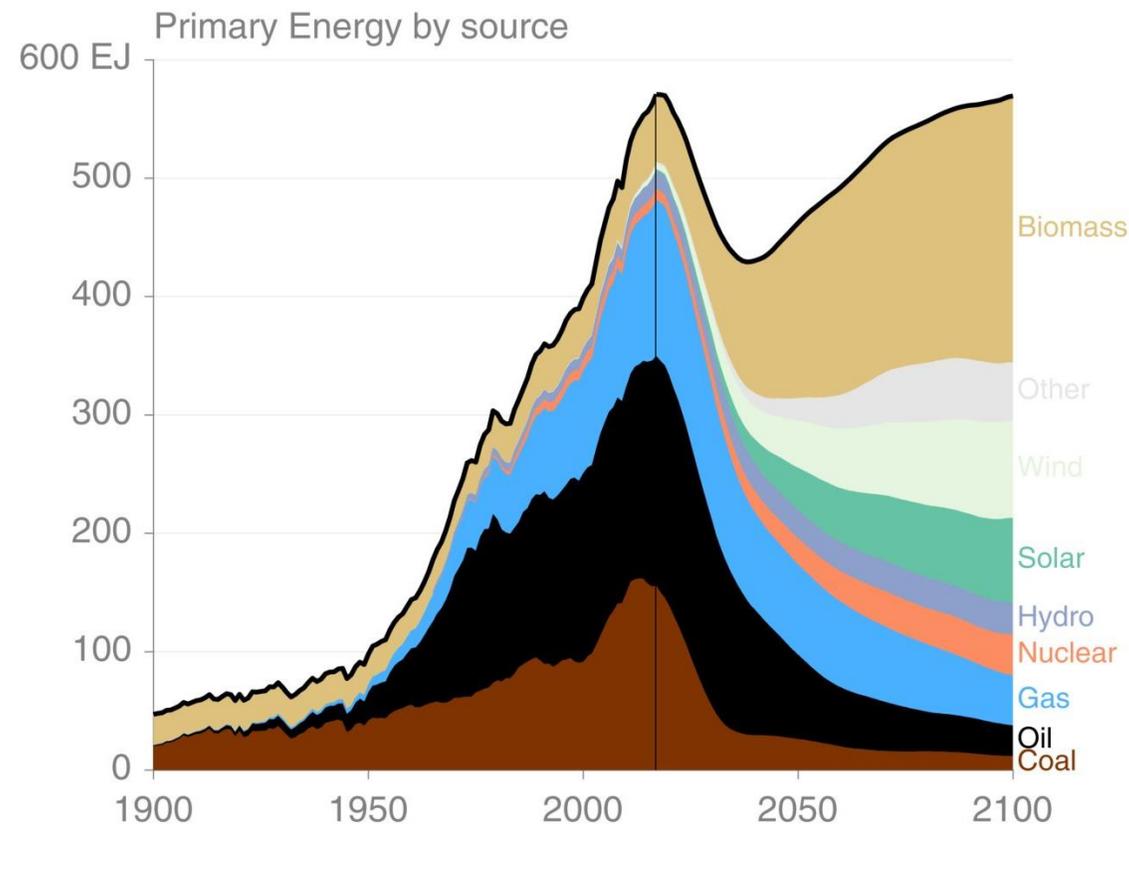
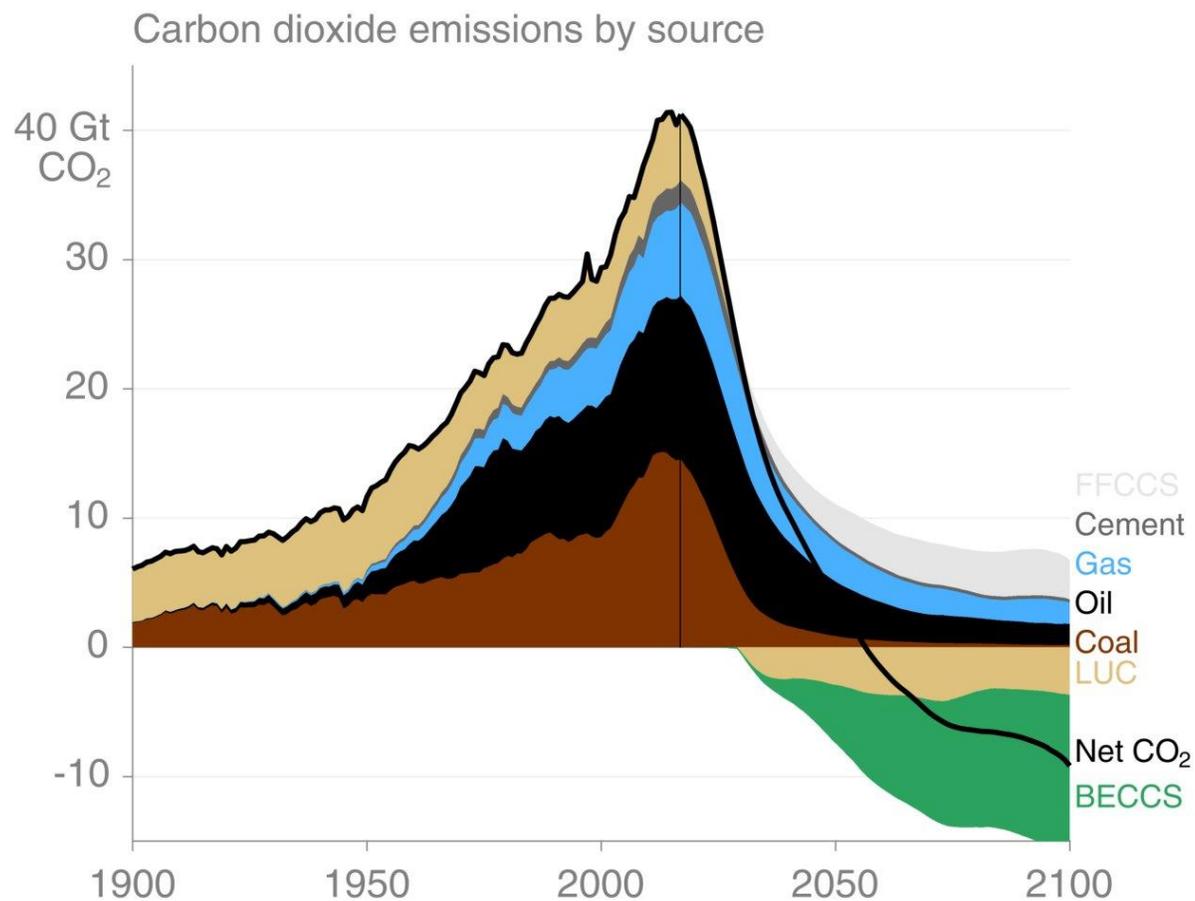
Neljä erilaista skenaariota poliitikoille 2/2

nopeasti
JA
paljon
vähäpäästöistä
sähköä



Mediaani malli

primäärienergia ”maltillinen”
hiili alas heti
päästöt alas heti
biomassaa paljon



LUC= metsitys
BECCS = negatiiviset päästöt

Lähde: Glen Peters (twitter)

Mitä tarvitaan

Elintavat

- ▶ Demand-side measures are key elements of 1.5 °C-consistent pathways. Lifestyle choices lowering energy demand and the land- and GHG-intensity of food consumption can further support achievement of 1.5 °C-consistent pathways (*high confidence*).
 - ▶ By 2030 and 2050, all end-use sectors (including building, transport, and industry) show marked energy demand reductions in modelled 1.5 °C-consistent pathways, comparable and beyond those projected in 2 °C-consistent pathways. Sectorial models support the scale of these reductions.

Hinta hiilelle välttämätön, mutta ei yksin riitä

- ▶ **A high price on emissions are necessary**
 - ▶ A price on carbon can be imposed directly by carbon pricing or implicitly by regulatory policies.
 - ▶ Other policy instruments, like technology policies or performance standards, can complement carbon pricing in specific areas.
- ▶ Evidence and theory suggest that carbon pricing alone, cannot reach the levels needed to trigger system transitions
 - ▶ in the absence of sufficient transfers to compensate their unintended distributional cross-sector, cross-nation effects, (*robust evidence, medium agreement*).

Negatiiviset päästöt 1/2

- ▶ **Carbon Dioxide Removal (CDR) deployed at scale is unproven and reliance on such technology is a major risk in the ability to limit warming to 1.5 °C.**
 - ▶ CDR is needed less in pathways with particularly strong emphasis on energy efficiency and low demand.
 - ▶ Bioenergy use is substantial in 1.5 °C-consistent pathways with or without Bioenergy with Carbon Capture and Storage (BECCS) due to its multiple roles in decarbonizing energy use.
 - ▶ Most least-cost mitigation pathways to limit peak or end-of-century warming to 1.5 °C make use of CDR, predominantly employing significant levels of Bioenergy with Carbon Capture and Storage (BECCS) and/or Afforestation and Reforestation (AR) in their portfolio of mitigation measures (*robust evidence, high agreement*)

Negatiiviset päästöt 2/2

- ▶ Land use and land-use change emerge as a critical feature of virtually all mitigation pathways that seek to limit global warming to 1.5°C (*robust evidence, high agreement*).
 - ▶ The land footprint per tonne CO₂ removed is higher for AR than for BECCS, but in the light of low current deployment, the speed and scales required for limiting warming to 1.5°C pose a considerable implementation challenge, even if the issues of public acceptance and missing economic incentives were to be resolved (*high agreement, medium evidence*).
 - ▶ The large potentials of afforestation and their co-benefits if implemented appropriately (e.g. on biodiversity, soil quality) will diminish over time, as forests saturate (*high confidence*).
 - ▶ At the local scale, soil carbon sequestration has co-benefits with agriculture and is cost-effective even without climate policy (*high confidence*). Its potential global feasibility and cost effectiveness appears to be more limited.

Knowledge Gaps

- ▶ **Knowledge gaps around implementing and strengthening the global response to climate change would need to be urgently resolved if the transition to 1.5°C worlds is to become reality. Remaining questions include:**
 - ▶ how much can be realistically expected from innovation, behaviour and systemic political and economic change in improving resilience, enhancing adaptation and reducing GHG emissions?
 - ▶ How can rates of changes be accelerated and scaled up?
 - ▶ What is the outcome of realistic assessments of mitigation and adaptation land transitions that are compliant with sustainable development, poverty eradication and addressing inequality?
 - ▶ What are life-cycle emissions and prospects of early-stage CDR options?
 - ▶ How can climate and sustainable development policies converge, and how can they be organised within a global governance framework and financial system, based on principles of justice and ethics (including Common But Differentiated Responsibilities and Respective Capabilities (CBDR-RC)), reciprocity and partnership?
 - ▶ To what extent limit warming to 1.5°C needs a harmonisation of macro-financial and fiscal policies, that could include financial regulators such as central banks?
 - ▶ How can different actors and processes in climate governance reinforce each other, and hedge against the fragmentation of initiatives?

Yhteenveto

- ▶ Kahden asteen lämpenemisen vaikutukset huonommat kuin aiemmin arvioitu
- ▶ 1.5 astetta tarkoittaa kaikkia välineitä: poliittisia, elämäntapa/kulutus muutos, rahallisia ja teknisiä
 - ▶ Kuten myös 2 astetta
- ▶ Päästöt saatava alas todella nopeasti
- ▶ Negatiivisten tekniikat suuressa roolissa - epäkohtia jonkin verran nostettu jo esille
- ▶ Herättääkö tämä raportti poliitikot ja muut ihmiset, jotta päästöt saadaan käännettyä laskuun?