

Adapting to a Changing Climate: Energy and Infrastructure

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Webpage: kliima.seit.ee

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Adapting the Energy and Infrastructure sectors

- The sectors have been in focus of climate change mitigation
- Mitigation needs to continue also when adapting – some measures can serve both mitigation and adaptation
- Adaptation measures need to guarantee that:
 - vital services are available in any climate conditions
 - energy independence, security and supply is not impacted by a changing climate



2 key sectors, 8 sectors, 26 sub-sectors

Infrastructure			Energy				
Technical support systems	Buildings	Transport	Energy independence and supply security	Energy resources	Implementing energy efficiency	Heat production and cooling	Electricity production
1. Transport infrastructure (roads, bridges, railways, airports, stations and ports) 2. Water and sewage grids 3. Electronic communications grid 4. Power grid 5. Gas grid	1. Residential buildings 2. Non-residential buildings	1. People's mobility and passenger transport 2. Cargo transport 3. Transport policy and management	1. Energy independence 2. Reliability of energy supply 3. Energy security	1. Wood 2. Biomass 3. Wastes 4. Solar energy 5. Wind energy 6. Hydro energy 7. Oil shale 8. Peat	1. Energy efficiency	1. Heat production 2. Cooling	1. Electricity production from oil shale 2. Electricity production from renewables



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Climate factors affecting the energy and infrastructure sector by the year 2100



Increase of mean annual temperature +4.3 °C
Increase of mean annual precipitation +19%
Increase in frequency of precipitation over 30 mm/day by 435%
Decrease of mean annual solar irradiation by -5%
Average duration of snow cover during the winter <10 days
Increase in frost days, < 15 days per year
Marine ice cover only in eastern part of the Gulf of Finland
Increase of wind speed during winter and spring by +18%
Sea level rise +67 cm
Decrease in fluctuation of water levels in bodies of flowing water and decrease of high waters during spring
Increased frequency of extreme weather events
Rise of the upper level of groundwater



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Transport infrastructure

- Increase of frost days impacts road safety and increases the need for maintenance
- Freeze-thaw cycle can cause damage to the infrastructure (e.g. road surface)



Maintenance requirements



Effects of freeze thaw cycle



Transport infrastructure

- Increase in frequency of precipitation (including during winter)
- Flood risk
- Sea level rise



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People's mobility and passenger transport

- Higher probability of traffic threats caused by extreme weather events
- Cycling season will last longer
- Better road passability during winter period (less snow) means increase in traffic and cargo transport during the season
- Less snow means longer dark period



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Transport infrastructure, people's mobility and passenger transport

Adaptation measures

- Increasing the durability of road surfaces to freeze-thaw cycles
- Road maintenance standards should be revised
- Analysing the environmental impact caused by the increased need of ice removal from roads
- Guarantee that small ports are durable to rising sea levels
- Considering longer dark period in traffic planning
- Area planned for roads, surface materials (e.g. parking lots) fall under spatial planning



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Buildings

Buildings are the most affected by increases in the frequency of extreme precipitation, heat waves through the whole country and flooding events of coastal areas.



Üleujutuste õppetund: oluline on ehitustegevuse planeerimine

26. mai 2019 21:30

Arhitektid

Täna me räägime sellest, kuidas planeerida ehitustegevust, sest kinnistustalade omanikele on oluline teada, kuidas planeerida ehitustegevust, et vältida kahjulikke tagajärgi.



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Buildings

- The rise in annual average temperatures may as a positive effect **decrease the average heat consumption** but at the same time **raise cooling demand** and with that **electricity consumption**.
- High temperatures have the biggest impact on office buildings and hospitals, buildings where people are staying during the daytime and are unable to choose/change their location, making the control of overheating more important than for houses.



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Buildings

Adaptation measures

- Research, surveys to provide better basis for design principles and regulations, including possibilities to use new technologies (e.g. green roofs, collecting and using rain water etc.)
- Awareness raising
- Capacity building of public and private sector experts
- Renovation support measures
- Energy efficiency in new buildings
- New fiscal schemes?
- Decisions made during spatial planning also impact the vulnerability of buildings



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Energy resources

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Climate change impacts

- Both positive and negative impact on the availability and quality of energy resources (*increase of wind speed, mean annual temperature and precipitation*)
- In general **bigger impact** on the amount, availability, transport and use of **renewable energy resources**
- Climate impacts vary on one resource due to the need of collecting it from the larger area than in case of fossil fuels
- Net **positive impact** on **wind energy resource**
- Small negative impact on using wood as an energy resource



Energy efficiency

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Climate change impacts

- Bigger impact during the second half of the century: higher frequency of extreme weather events (strong wind, lightning, heat and cold waves, heavy showers)
- **Rise of mean annual temperature, increased amount of precipitation and increase of wind speed have impact on:**
 - Heating and cooling in buildings
 - Fuel demand of vehicles
 - Marine transport
 - Rain water treatment, communal services, winter sport centres
 - Irrigation and drainage in agriculture
 - Combined heat and power stations, heat pumps, solar panels – collectors, wind turbines, solid biofuels, electric grid (above ground)



Energy independence, supply reliability and energy security

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Climate change impacts

- Heat production is mainly affected by air temperature during the heating season:
 - consumption volume, losses, efficiency of devices, necessary heat production capacity to cover estimated maximum heating demand
- **vulnerability** depends on the energy efficiency of buildings, and heating and cooling devices
- extreme weather events may cause temporary break of electricity supply for electric devices.



Electricity production

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Renewables:

- Climate change impact is low
- Needs attention as it gains more importance in electricity production
- **Wind speed, ice conditions** – offshore wind farms
- **Cloudiness** – solar energy, increase in micro production

Oil shale:

- Increase in precipitation – possible flooding
- Increase in mean annual temperature -> increase in cooling water temperatures -> higher own consumption of electricity for keeping water pumps in work



Energy sector

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Adaptation measures

- Applied research on possible climate risks on wind energy, including offshore wind farms
- Supplementing sectoral regulations and norms (taking into account climate change risks), minimizing the vulnerability of infrastructure
- Researching and developing energy efficient irrigation and drainage for agriculture and forestry, providing guidelines
- Guarantee that heating grid is efficient and climate sound, local municipalities play big role



Increasing the share of domestic renewable energy resources

Thank you!

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