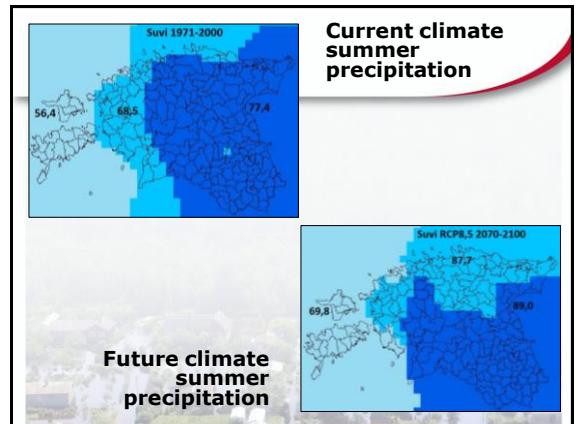
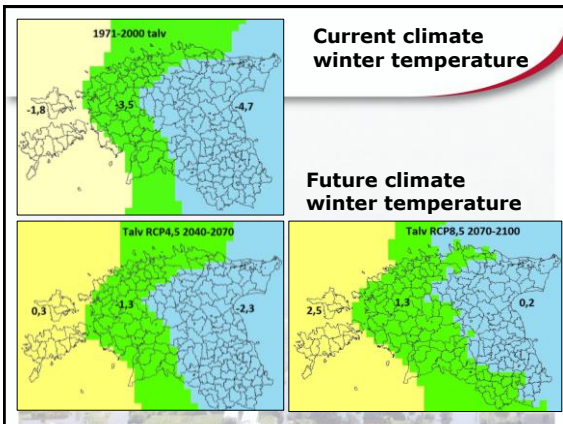
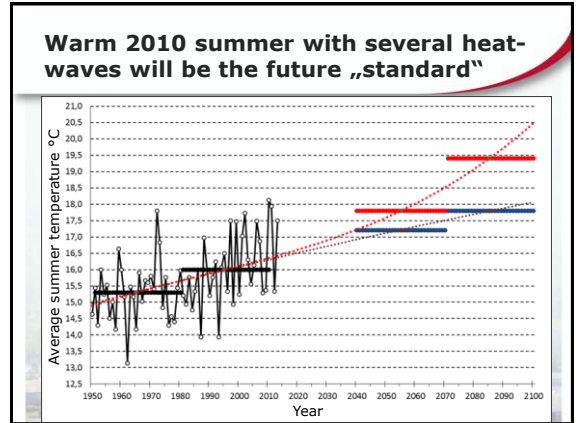
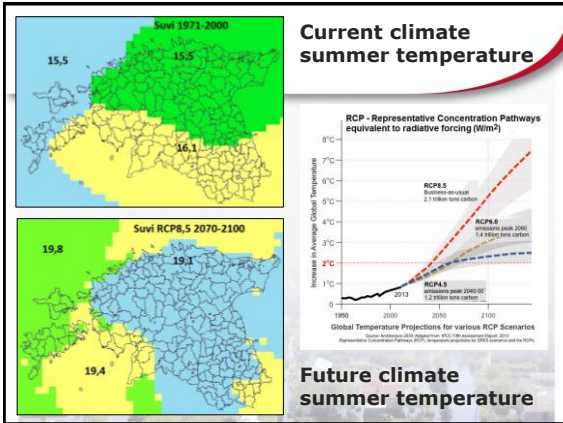


Adapting to Climate Change in Estonia: Planning, Land-use, Health and Rescue Management

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How the future climate will look like?



Climate change health effects

Effects through:

- Extreme weather events
- Air quality
- Water related problems
- Food safety
- Vector borne diseases
- UV-ration and sun-light
- Health inequalities and migration

Effects of extreme temperatures on mortality in 1996–2013 in Estonia

- Extremely high temperatures increased mortality* on average by 18% (lag 0-2)
- Bigger effects in Inland Estonia and especially among elderly (75+), where mortality increased by 45%

*excluding external causes
Äström et al., 2016

Effects of extreme temperatures on external mortality in Estonia

- Mortality due to external cause increases in both, extremely high and low temperatures
- Due to small number of cases, we did not have enough statistical power to analyze separate causes as accident, drownings etc.

Orru & Äström, under review in IJBM

Future increases of temperatures and effects on mortality

- Based on the analysis in Estonia in 1996-2013, an increase in the average temperature by 1 °C increased total mortality by 1.68 %

Period	Average temp (°C)	Temp increase† (°C)	Mortality increase‡ (%)	Number of excess death annually*
1971–2000	5.3			
2040–2070 RCP4.5	7.3	2.0	3.4	506
2040–2070 RCP8.5	8.0	2.7	4.6	679
2070–2100 RCP4.5	7.9	2.6	4.4	655
2070–2100 RCP8.5	9.6	4.3	7.3	1 068

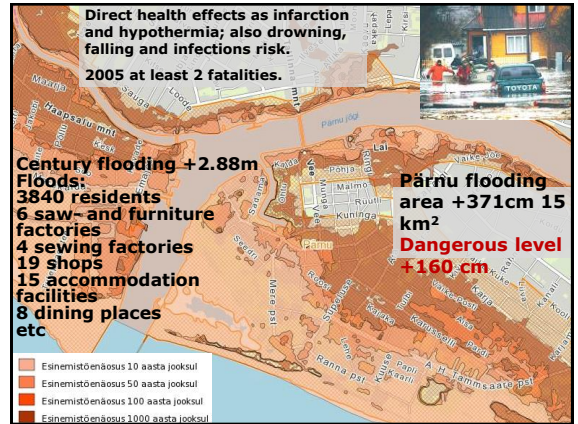
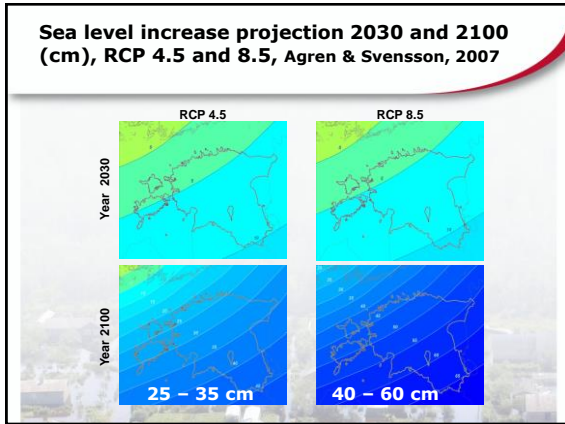
*based on the average baseline mortality in 2010-2014, the factors other than the air temperature were left constant

Number of above +27 °C days will increase

Area, meteorol. station	Norm climate 1971-2000	RCP4,5 2040-2070	RCP8,5 2040-2070	RCP4,5 2070-2100	RCP8,5 2070-2100
Lääne Eesti					
Tallinn	4.8	11.0	13.8	14.1	22.7
Lääne-Nigula	7.4	15.2	18.2	19.1	28.9
Pärnu	6.7	13.6	16.9	17.5	27.1
Eastern Estonia					
Jõhvi	5.6	11.2	14.7	15.5	26.1
Tartu	8.7	17.3	21.2	22.6	34.9
Võru	11.0	20.7	24.7	25.9	38.9
Central Estonia					
Türi	8.7	17.7	20.6	20.6	32.4

Air quality and allergies

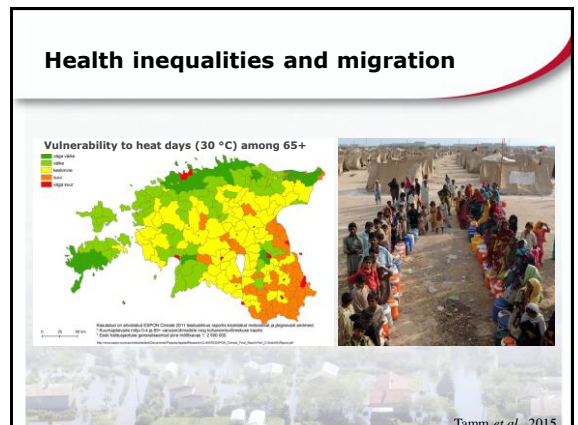
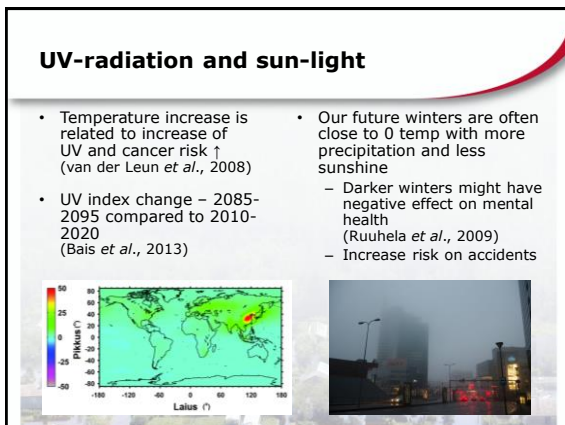
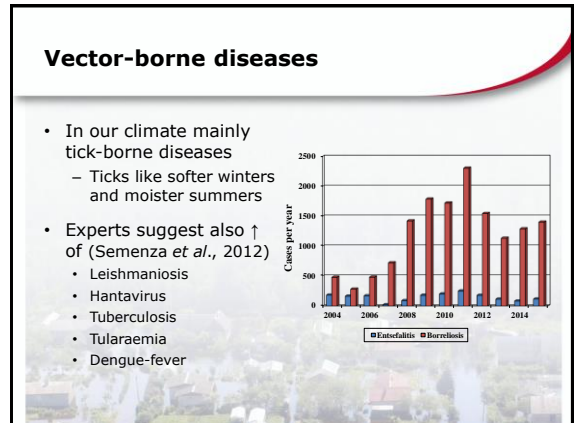
- Currently near surface ozone is inducing up to 130 premature deaths in Estonia annually (Orru et al., 2016)
 - Due to climate change this could decrease 5-7% by 2020-2050 and 11% by 2040-2060 (Orru et al., 2013)
- Premature mortality due PM might increase, but the results are high sensitive to the climate model (Geels et al., 2015)
 - The risk of forest fires might also increase (EEA 2012)
 - In 2002 six premature deaths could have been induced (Lanki, 2015)
- About 10% of Estonians are allergic to pollen, which amounts are expected to increase significantly (Giorgi & Torma, 2015)



Food safety – pathogens

- Temperature increase in countries with moderate climate is related to increase of mycotoxins on crops
- Temperature increase could increase food-borne diseases' prevalence
- Temperature increase would significantly also increase risks in Estonia (keeping other factors constant, Kovats *et al.*, 2004)

Country	Temp. range (°C) (9-week average)	Country-specific threshold (95% CI)* (°C)	% change per °C above country threshold (95% CI)	% change per °C overall threshold (6 °C) (95% CI)	Population attributable fraction (%) (95% CI)†
Poland	-1 to 18	6 (•-7)	8.7 (4.7-12.9)	8.7 (4.7-12.9)	33.8 (20.2-45.1)
Scotland	3 to 16	3 (•-12)	4.7 (2.1-7.3)	5.0 (2.2-7.9)	15.2 (7.06-22.58)
Denmark	-3 to 18	15 (••)	1.1 (-2.7-5.0)	0.3 (-1.1-1.8)	1.3 (•-6.5)
England & Wales	3 to 18	•-6 (•)	12.4 (4.6-18.3)	12.5 (4.1-16.1)	41.2 (28.6-42.7)
Estonia	-7 to 17	13 (3-14)	18.3 (3.6-35.1)	9.2 (-0.9-20.2)	27.4 (•-48.0)
The Netherlands	-1 to 19	-1 (7-8)	9.9 (0.0-19.7)	9.8 (0.0-19.7)	22.6 (30.3-34.8)
Czech Republic	-7 to 20	-2 (-8 to -1)	9.1 (0.2-19.7)	9.2 (7.6-10.7)	29.1 (17.4-33.4)
Switzerland	-1 to 21	3 (•-3)	8.8 (7.6-9.9)	9.1 (7.9-10.4)	35.5 (31.7-39.1)
Slovak Republic	-4 to 20	6 (••)	2.5 (-2.6-7.8)	2.5 (-2.6-7.8)	11.5 (•-31.3)
Spain	6 to 25	6 (••)	4.9 (3.4-6.4)	4.9 (3.4-6.4)	33.1 (26.3-42.8)



Estonians' climate risk perception – weak Health systems capability to adapt – weak MEASURES ESSENTIAL

Based on KesTeRisk study:

(1) only 10% assessed their exposure to extreme weather events big or very big
 (2) 50% said that extreme weather does not cause them any health effects
 (3), (4) risk for own health was assessed lower than for risk for Estonian in general

Based on interviews with 14 key experts capability to adapt currently weak, significant changes are needed

Oru K et al., 2016

Adaptation measures – warning systems and action plans

- **Better warning systems**
 - Heat waves
 - Decrease warning criterias
 - Air quality incl pollen
 - Drinking water quality ↓
 -
- **Action plans beeded, what the institutions should do in case of warnings**
- **Increase public knowledge to take warnings seriously and to know what to do in case of warnings**





Thank you!

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