

1. Vulnerability and Adaption to Heat in Cities:
Perspective and Perceptions of Adaptation
Decision-Makers in Sweden, case Gothenburg
2. Guidebook for Integrated Assessment and
Management of Vulnerability to Climate Change



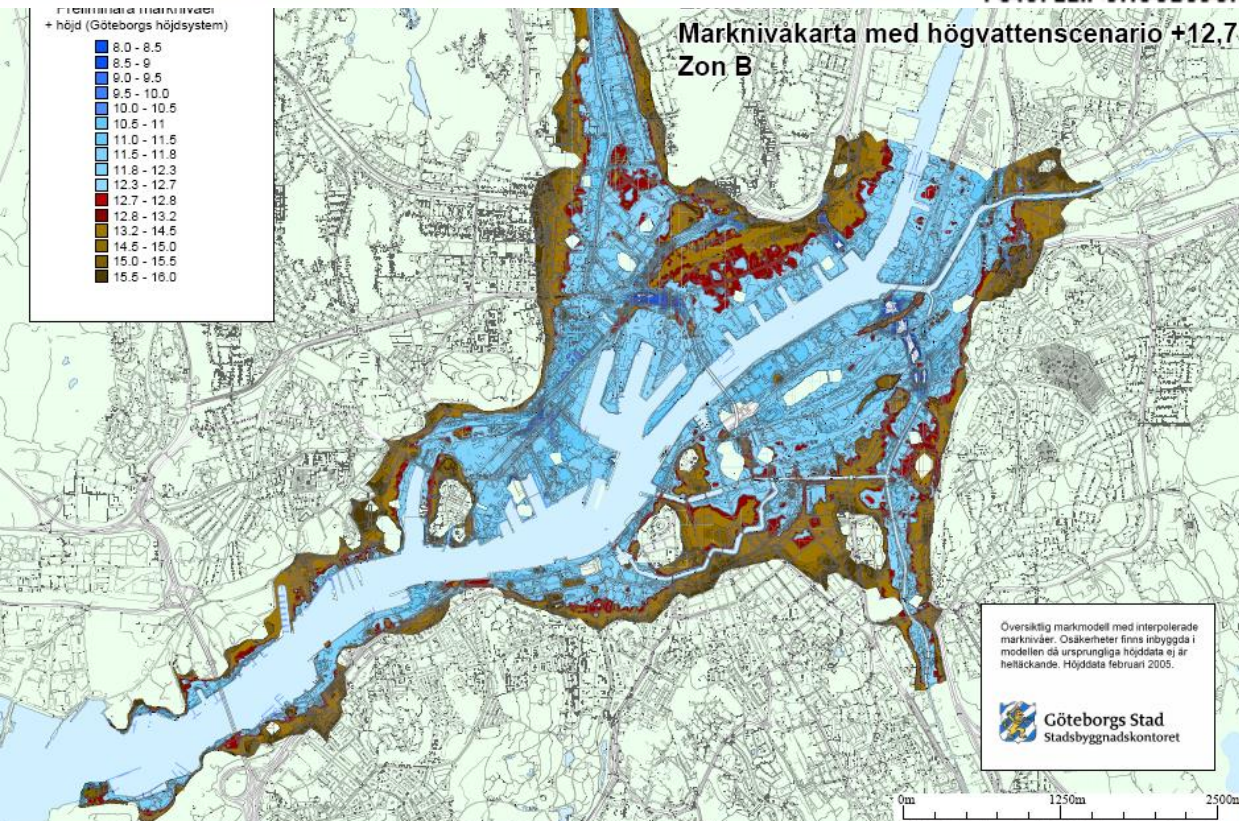


Foto: LEIF JACOBSSON

Marknivåer i marknivåer
+ höjd (Göteborgs höjdsystem)

- 8.0 - 8.5
- 8.5 - 9.0
- 9.0 - 9.5
- 9.5 - 10.0
- 10.0 - 10.5
- 10.5 - 11.0
- 11.0 - 11.5
- 11.5 - 11.8
- 11.8 - 12.3
- 12.3 - 12.7
- 12.7 - 12.8
- 12.8 - 13.2
- 13.2 - 14.5
- 14.5 - 15.0
- 15.0 - 15.5
- 15.5 - 16.0

Marknivåkarta med högvattensscenario +12.7 Zon B



Översiktlig markmodell med interpolerade
marknivåer. Osäkerheter finns inbyggda i
modellen då ursprungliga höjddata ej är
heläckande. Höjddata februari 2005.



Göteborgs Stad
Stadsbyggnadskontoret

0m 1250m 2500m



FOTO: ADAM IHSE/SCANP



Some drivers of (climate) vulnerability



Locality



Demography



Health



**Life
style**



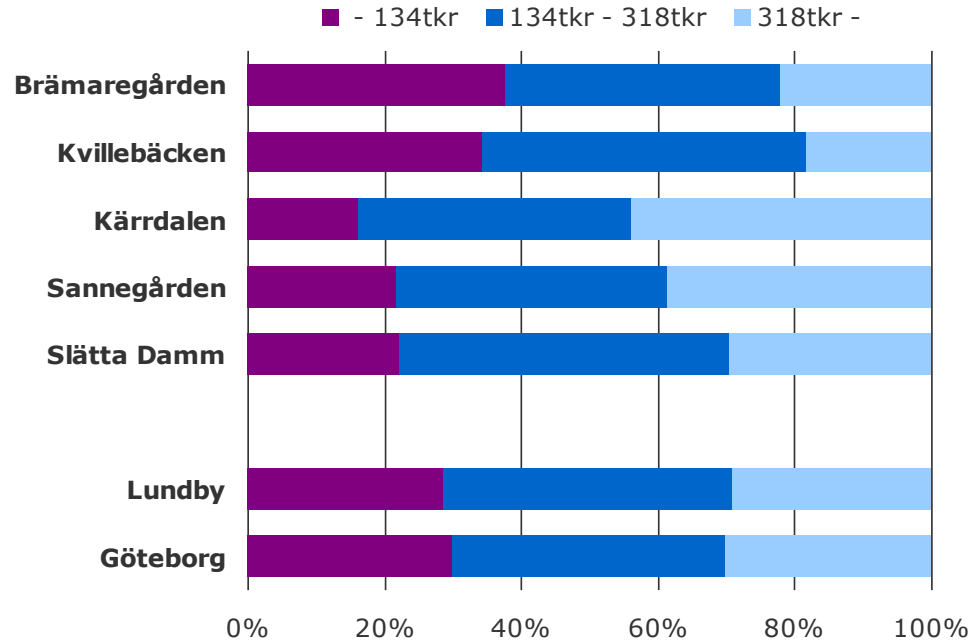
**Socio-
economy**

adaptive capacity ...

Income distribution
Lundby, Gothenburg
2009, 20-64 years



Göteborgs Stad
Stadsledningskontoret

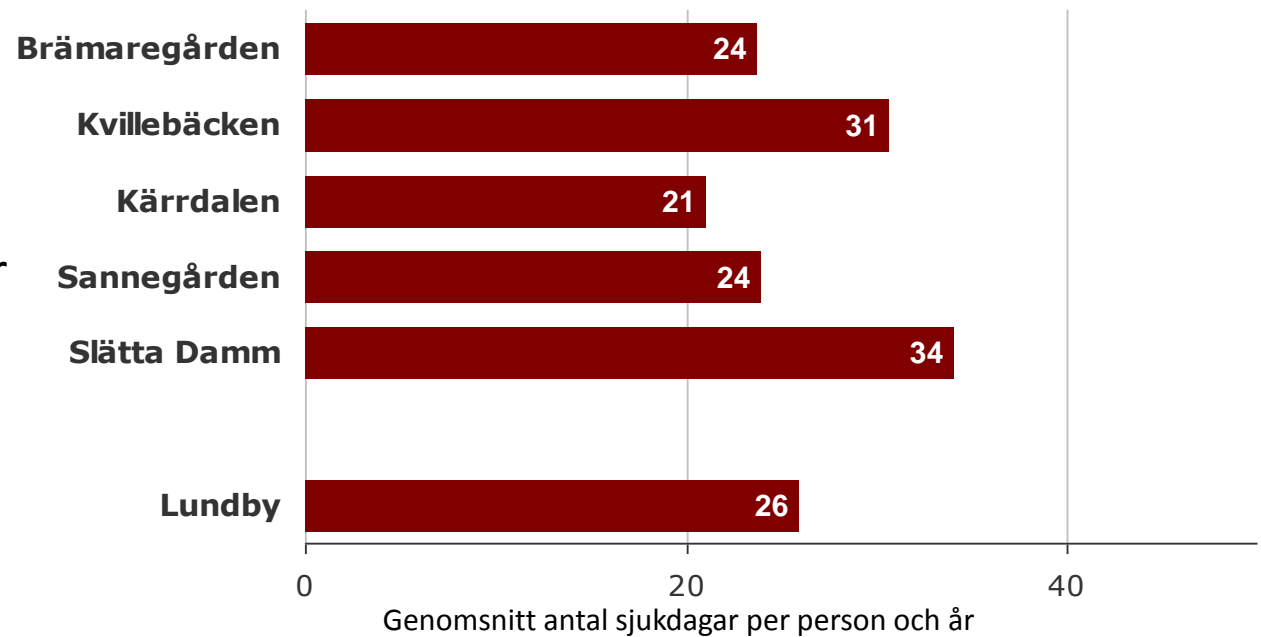


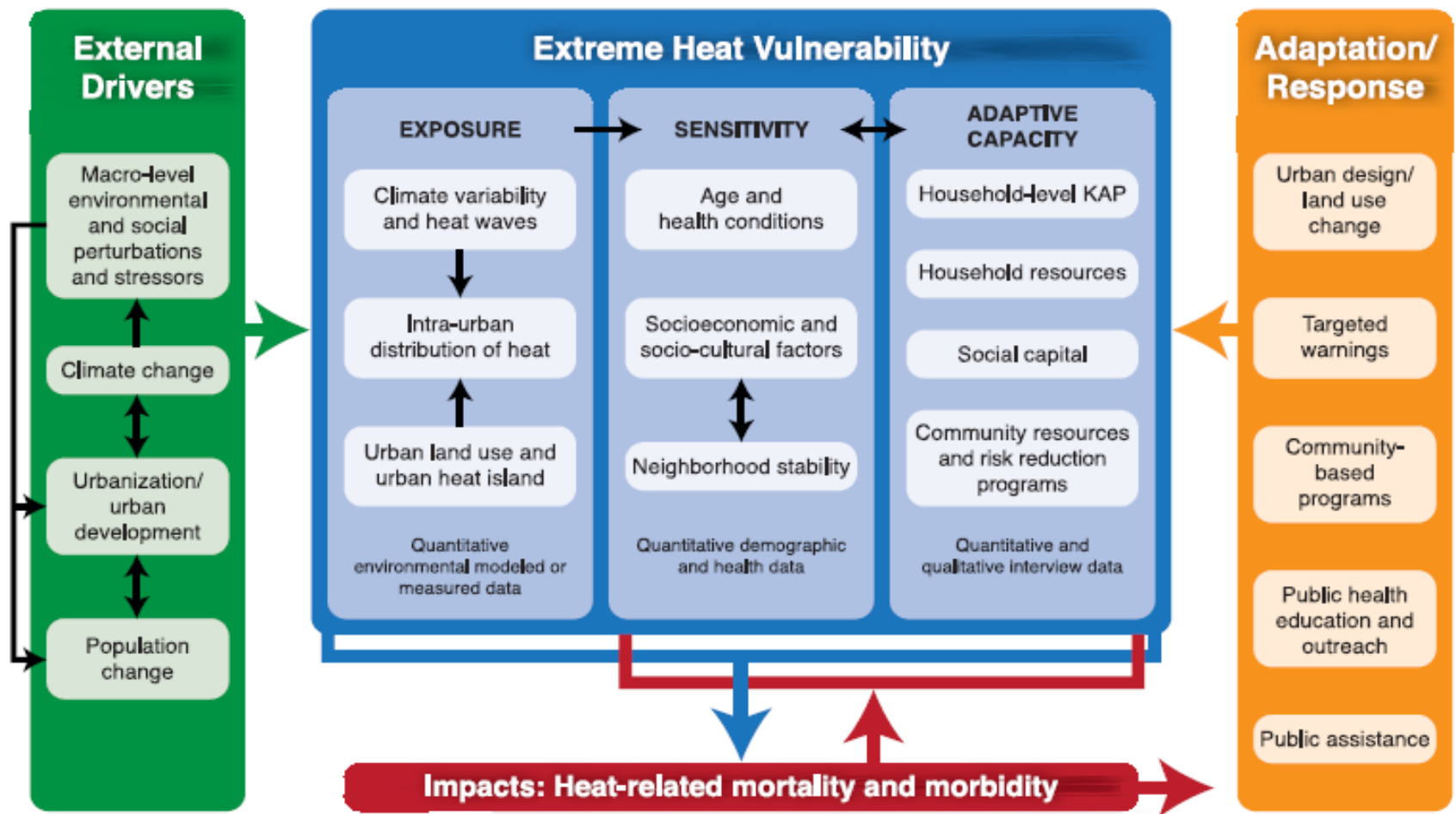
sensitivity ...

Illness indicator
Lundby 2010
16-64 år



Göteborgs Stad
Stadsledningskontoret





Wilhelmi and Hayden (2010)

Are Swedes vulnerable to heat?



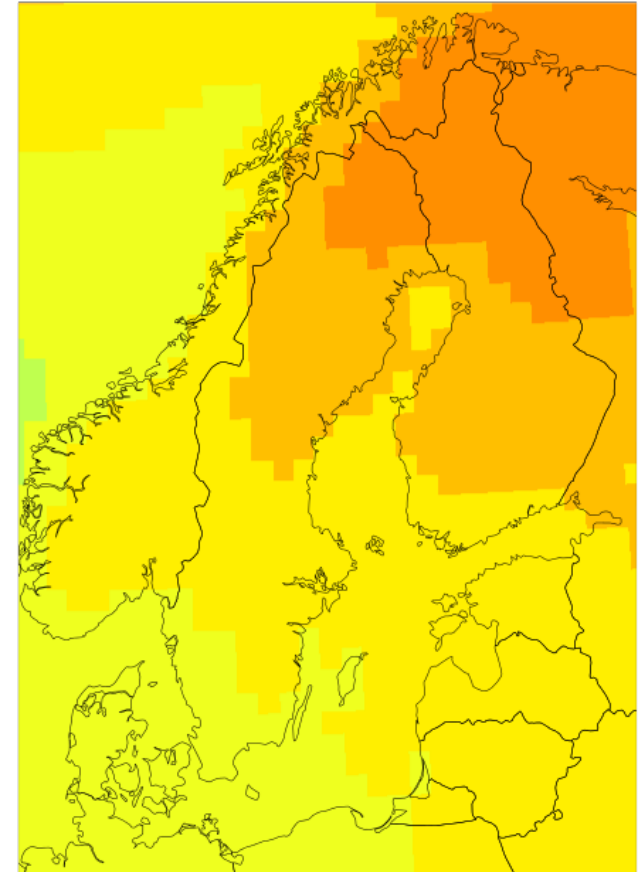
Climate change effects in Sweden: wetter, warmer, wilder

Daily mean temperatures
above 68 F

→ increased mortality

(Rocklöv et al 2008)

Medelvärde 9 modeller, rcp85
2071-2100 - 1971-2000 ANN



1 2 3 4 5 6 7 8 9 10 11 12

tas(C)

Adaptation to heat in Sweden?



Earlier approaches

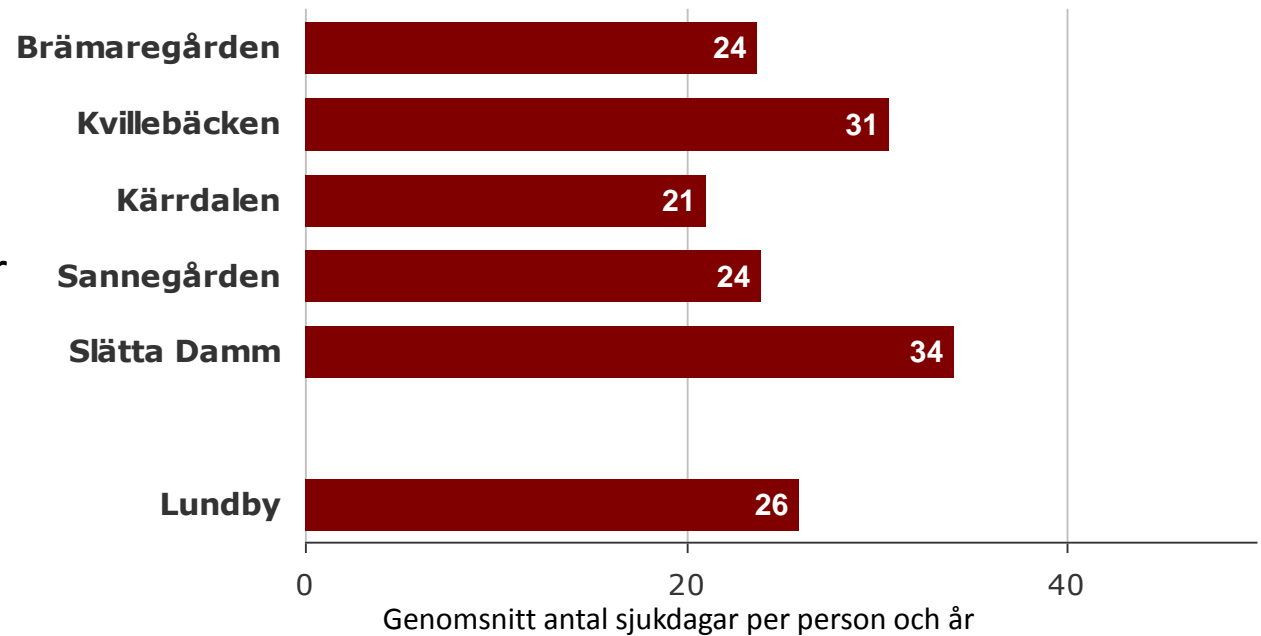
Epidemiology, GIS, statistics and manuals

sensitivity ...

Illness indicator
Lundby 2010
16-64 år



Göteborgs Stad
Stadsledningskontoret



Earlier approaches

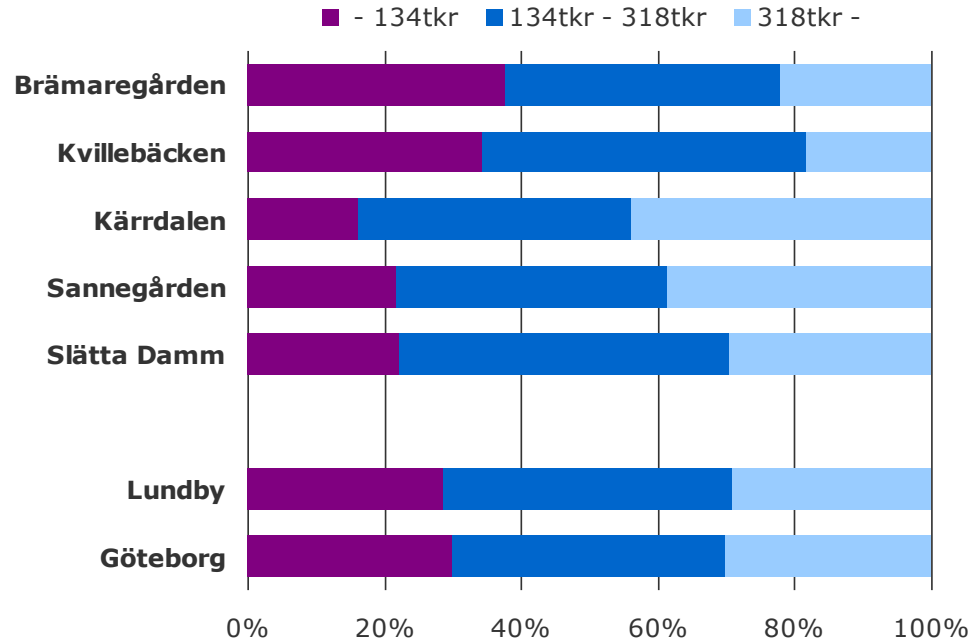
Epidemiology, GIS, statistics and manuals

... and adaptive capacity

Income distribution
Lundby, Gothenburg
2009, 20-64 years



Göteborgs Stad
Stadsledningskontoret



Earlier approaches

Epidemiology, GIS, statistics and manuals

Vilka inom riskgruppen har/har inte beslut om stöd och hjälp från kommunen?



OBS! All information är påhittad

(Botkyrka, 2011)

THE VULNERABILITY FACTOR CARD GAME

- Used in research: (**Jonsson and Lundgren, 2014**).
- Tried out in five focus groups in City of Gothenburg
 - “Hard planners”
 - “Soft planners”
 - Staff in child care
 - Staff in elderly/health care
 - Elderly

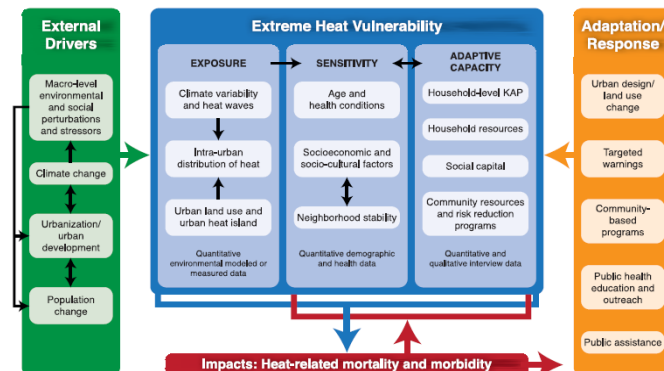
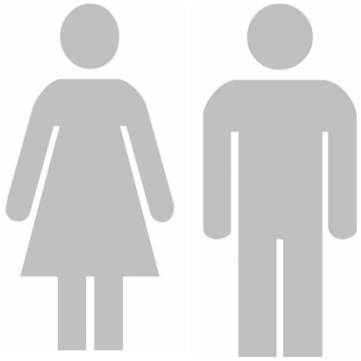


THE VULNERABILITY FACTOR CARD GAME

- Tool to study the Perspective and Perceptions of Adaptation Decision-Makers
- Boundary object to facilitate bottom-up deliberations on vulnerability and adaptation strategies
- Educational game



Structure and basic idea of the tool





Demographic cards	Vulnerable demographic groups ¹
Female	Women ¹⁻⁹
Male	Elderly ^{1-7,9-16}
0-5 years	Young children ^{1-3,5,6,9-14,16}
5-15 years	
15-25 years	
25-35 years	
35-45 years	
35-65 years	
65-80 years	
80+ years	

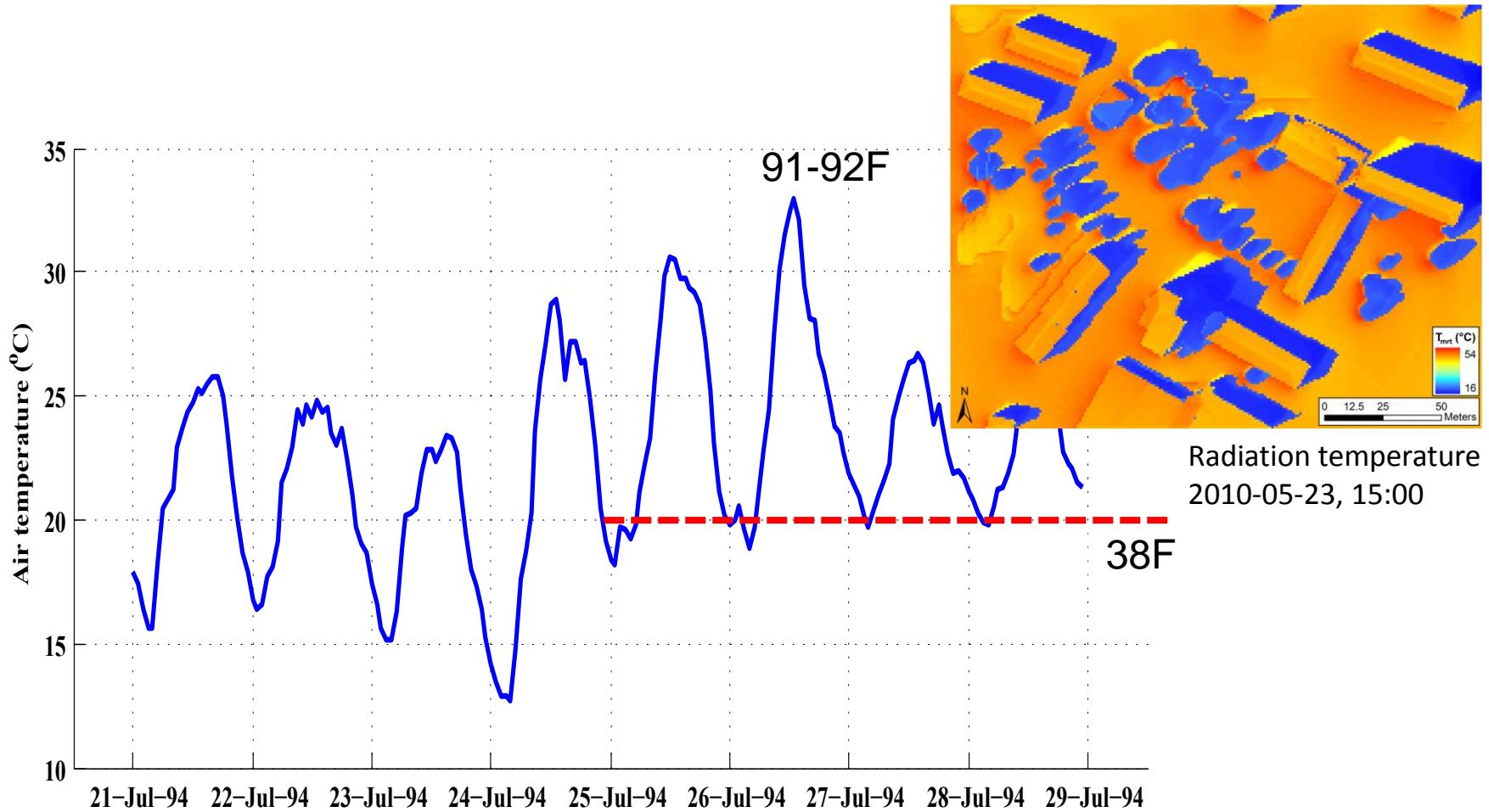
Socio-economic cards	Socio-economically vulnerable groups
Social welfare	Low income ^{1-6,8,10-15,17}
Low income	Poverty ^{1-3,7-10,12,13,15,16,18}
High income	Unemployment ¹⁻
Unemployed	5,8,11,13,16,17
Lack of resources	Lack of resources ¹⁻
Low education	4,6,9,10,15-18
High education	Low education ^{1-4,8,9,11-}
No car	13,15-17
Owns a car	No car ^{2,11}

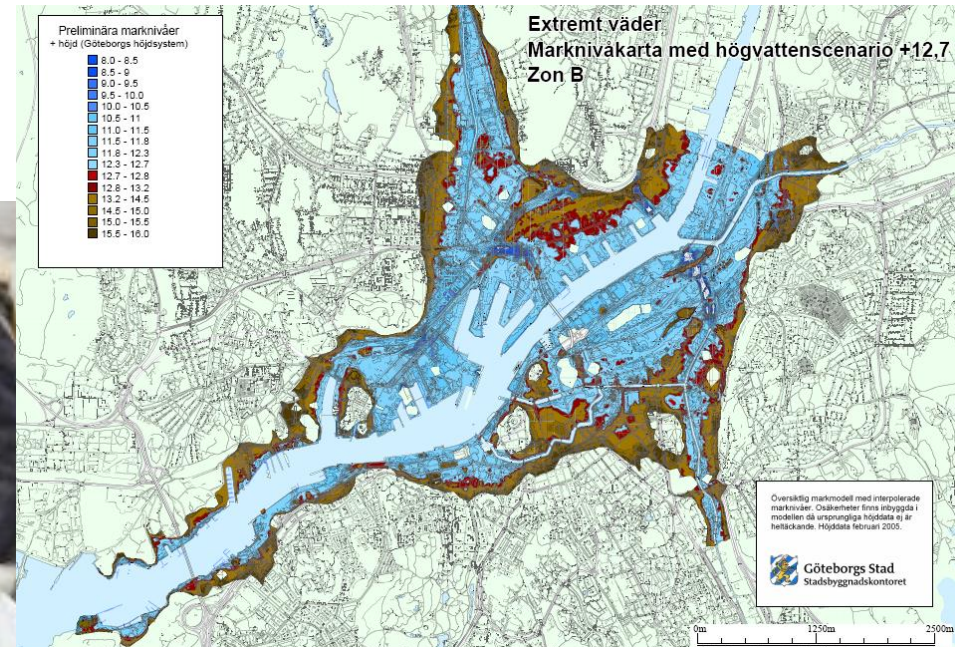
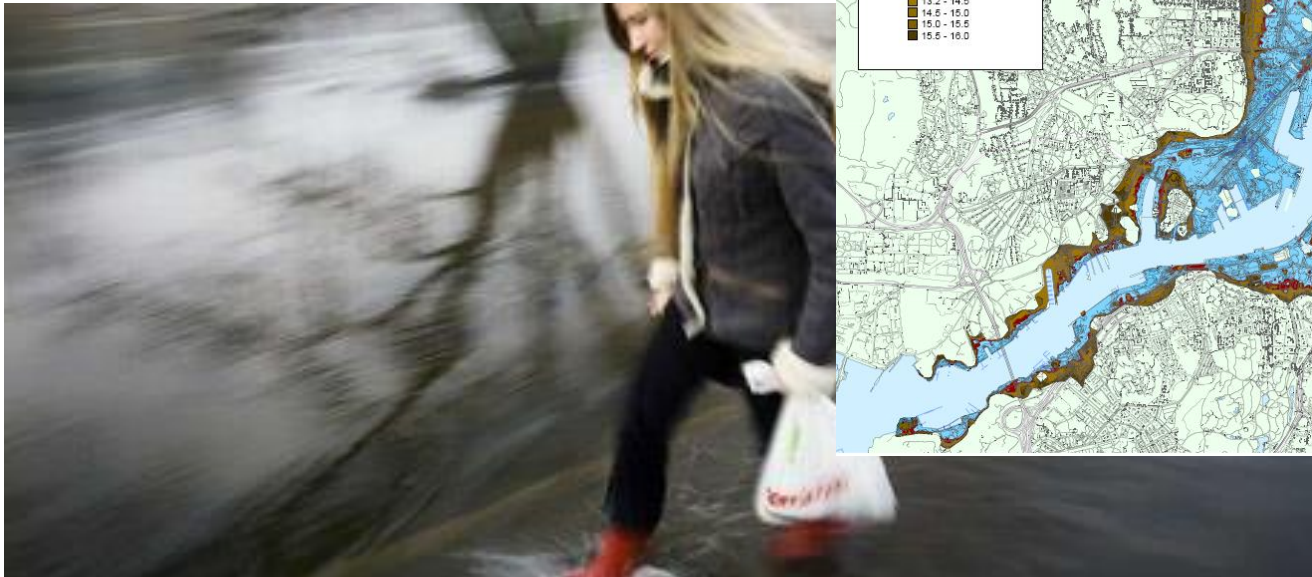
Socio-cultural cards	Socio-culturally vulnerable groups
Native	Immigrants ^{4,11,14}
Foreign origin	Language barriers ^{1,2,4,10,14}
	Race/ethnicity ^{1,2,4,10,14}

Social capital cards	Vulnerable groups with regards to social capital
Living alone	Living alone/lack of social networks ^{1,2,4-6,11,14-18}
Living with family	Social isolation ^{5,6,11,15,16}
Lack of social networks	Single parents ^{1,2,4,5,10,14}
Single parent	Large families ^{1,5}
Large family	

Health and lifestyle cards	Vulnerable groups with regards to health and lifestyle
Disabilities	Diseases or illnesses ^{1-6,9-11,15,16}
Heart/Lung disease	Disabilities ^{2,4-6,9,11,14}
Smoker	Poor lifestyle ⁶
Overweight	
Dependent on health care services	

(1) Cutter et al. (2003), (2) Dwyer et al. (2004), (3) Heltberg et al. (2009), (4) Holand et al. (2011), (5) Kuhlicke et al. (2011), (6) Morss et al. (2011), (7) Rey et al. (2009), (8) Siddiqi. (2011), (9) Balbus & Malina. (2009), (10) Rød (2012), (11) Buscali et al. (2011), (12) Johnson. (2009), (13) Johnson. (2012), (14) King & MacGregor (2000), (15) Reid et al. (2009), (16) Willhelmi & Hayden (2010), (17) Cutter et al. (2008), (18) Engle (2011)





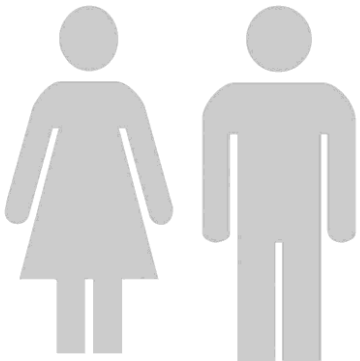




Impact cards

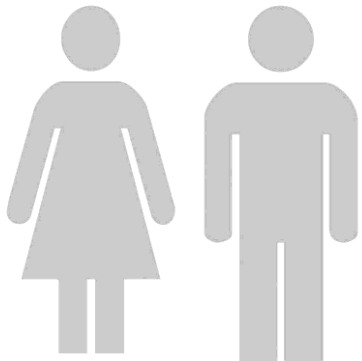
Death
Hospitalization
Illness
Loss of income
Loss of assets
Reduced wellbeing

Other effects?
When?



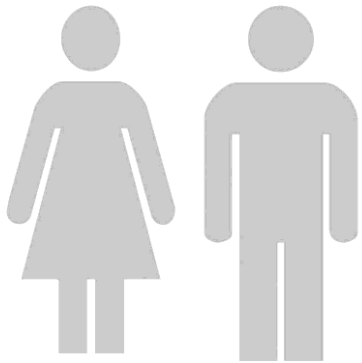


Adaptation responses



Results

- Svea, Sven and the others



Focus group	“Hard planners”	“Soft planners”	Staff in child care	Staff in elderly/health care	Elderly
Females	Harriet***	Svea***	Jane*	Astrid**	Raija***
Age	Above 80 years	Above 80 years	0-5 years	65-80 years	65-80 years
Socio-economic status	Lives alone in social isolation, Foreign origin, Low income, High education level	Lives alone, Low education	Lives with mother and father, Foreign origin, Low income (family), Own car (family)	Lives alone in social isolation, Low income, Owns a car	Lives alone in social isolation, Foreign origin and problems with language, Low income, Low education level
Health and lifestyle	Limited mobility, Overweight	Dependent on healthcare, Cardiovascular disease, Overweight	Disability in family	Limited mobility, Dependent on healthcare, Cardiovascular disease, Smoker and lung disease, Leg ulcers, Overweight	Limited mobility, Dependent on healthcare, Cardiovascular disease, Diabetes, Overweight
Impact	Morbidity/hospitalisation, Mortality	Morbidity/hospitalisation, Mortality	Reduced, wellbeing/Morbidity	Loss of assets, Morbidity/hospitalisation	Morbidity/hospitalisation, Mortality
Males	Harald	Sven***	John*	Sture**	Richard*
Age	30-45 years	45-65 years	30-45 years	Above 80 years	45-65 years
Socio-economic status	Single-parent, High income, Owns a car	Homeless and in social isolation, Unemployed with low income (welfare), Low educational level, Does not own car	Single-parent, Normal income, Outside worker	Lives alone in social isolation, High income and economic resources, Does not own a car	Lives alone, High income, Owns a car
Health and lifestyle	Cardiovascular disease	Smoker	Smoker	Limited mobility, Dependent on healthcare, Cardiovascular disease	Cardiovascular disease, Smoker
Impact	Reduced wellbeing	Morbidity/hospitalisation, Mortality	Loss of income, Reduced wellbeing/Morbidity	Morbidity/ possibly hospitalisation	Loss of assets, Reduced wellbeing/Morbidity
* Person gets ill during heat wave ** Person becomes ill and is hospitalised during heat wave *** Person dies during heat wave					

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Health and lifestyle	Cardiovascular disease	Smoker	Smoker	Limited mobility, Dependent on healthcare Cardiovascular disease	Cardiovascular disease, Smoker
Impact	Reduced wellbeing	Morbidity/hospitalisation Mortality	Loss of income, Reduced wellbeing/Morbidity	Morbidity/ possibly hospitalisation	Loss of assets, Reduced wellbeing/Morbidity
* Person gets ill during heat wave ** Person becomes ill and is hospitalized during a heat wave *** Person dies during heat wave					

Results: distribution of vulnerability drivers

Harriet
Svea
Astrid
Raija
Sture

female
old

Sven

homeless

Harald
John
Richard

male
middle age

Jane

child

Results: impacts

Harriet
Svea
Astrid
Raija
Sture

Death
Hospitalization

Sven

Jane

Harald
John
Richard

Loss of income
Loss of assets
Reduced wellbeing

Reduced, wellbeing
Illness

Results: adaptation strategies at different levels

Harriet
Svea
Astrid
Raija
Sture

Sven

- water, ice cream, salt, clothing
- open window, fan/AC, shades
- adjust medication, remind about drink and food, stay indoors, keep moving/keep still
- increased support from care sector, special heat-person at each elderly care institution, increase knowledge, access to hostel
- plan city for cool places

Jane

- Play with water or "slow" activities
- Develop emergency plans for heat
 - Design playgrounds for shade
 - Plant greenery

Harald
John
Richard

- water, clothing
- AC/fan, shades, take car to nice location, search for shade and cool place
- better local planning for heat

Results: learning through talking

- Enthusiastic! "like a Hollywood movie"
- A lot of knowledge is already there: discussions articulate the problem area
- Numerous suggestions of measures
 - Short and long term
 - For individuals, operational and strategic level of municipality
 - From personal and professional experience

Discussion

- Victims and heroes(?)
- Moral judgements
- Budget restrictions
- Blind spots
- Because of overlay of vulnerability drivers:
Relevance of inter-sectionality perspective

“The only problem we have in Kota is parking!”
(city planner Kota, 2012)



Spinn-offs?

Included in advice for City of Gothenburg

Could be used as an educational tool

- to increase knowledge about climate change impacts
- to identify preventive adaptation measures and increased adaption capacity



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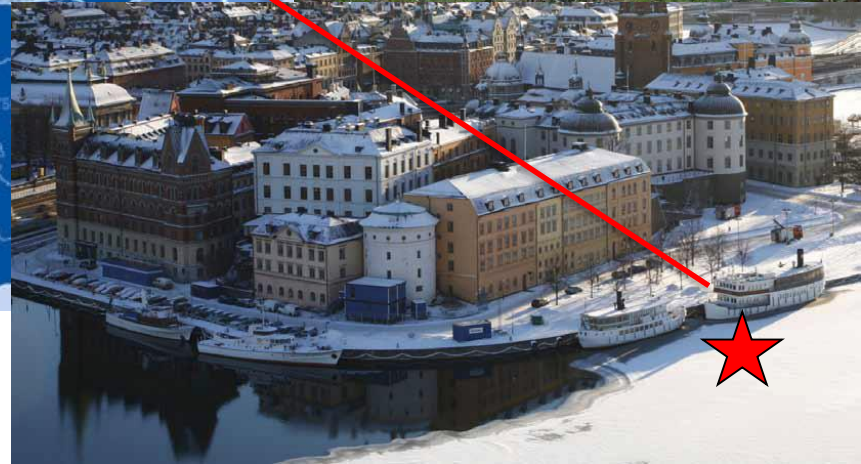
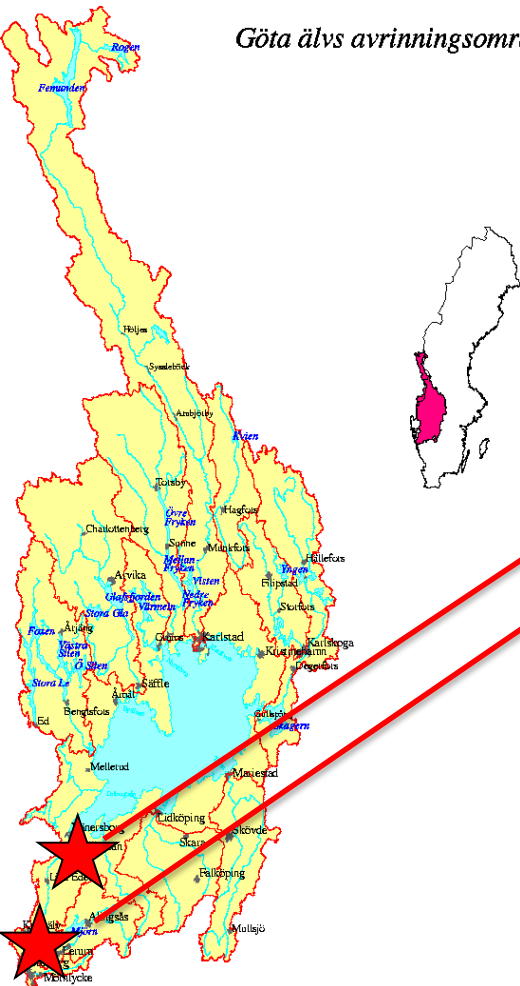


Background

- Long experience of participatory research and collaborative modelling
- Long range of projects in climate vulnerability and adaptation using participatory techniques
- Why not put them together in a toolbox!?



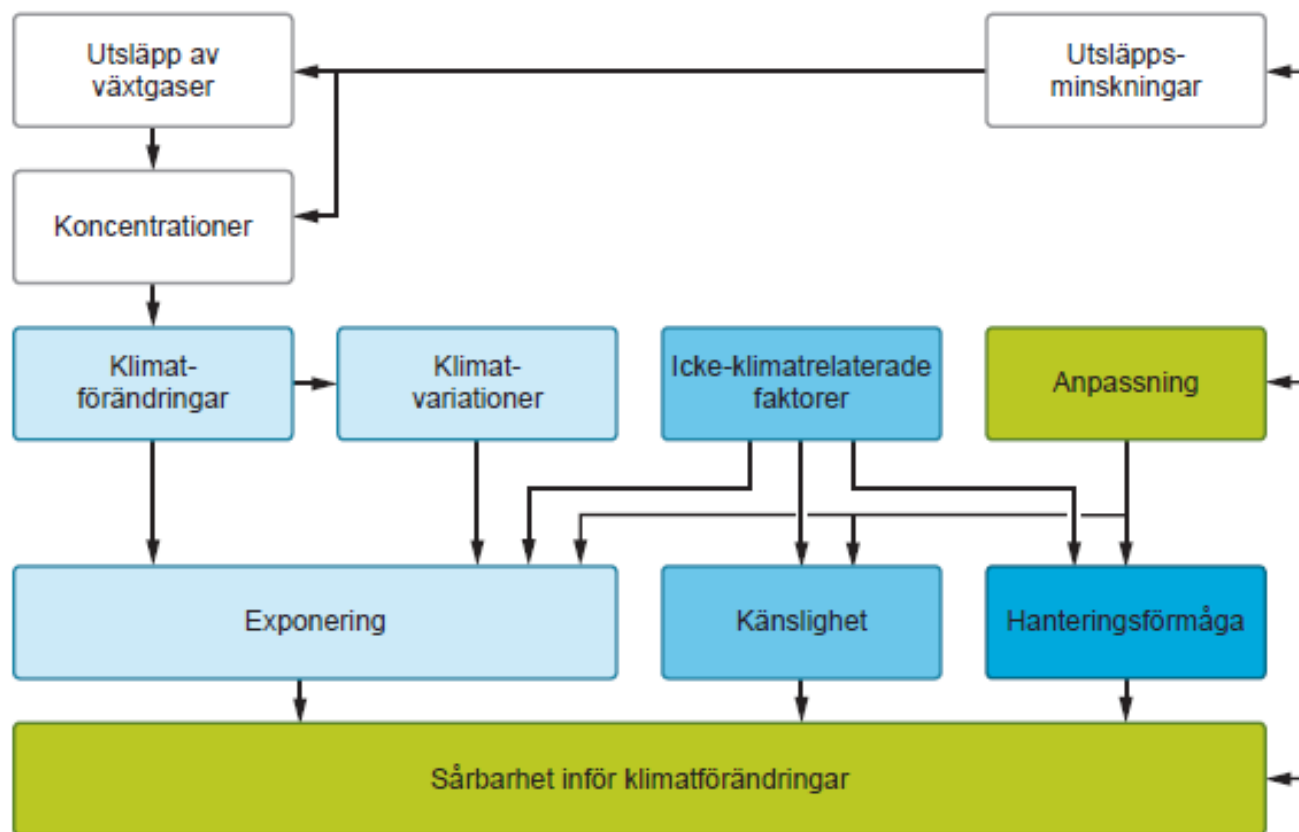
Tools for integrated vulnerability assessment



(old) IPCC definition of vulnerability

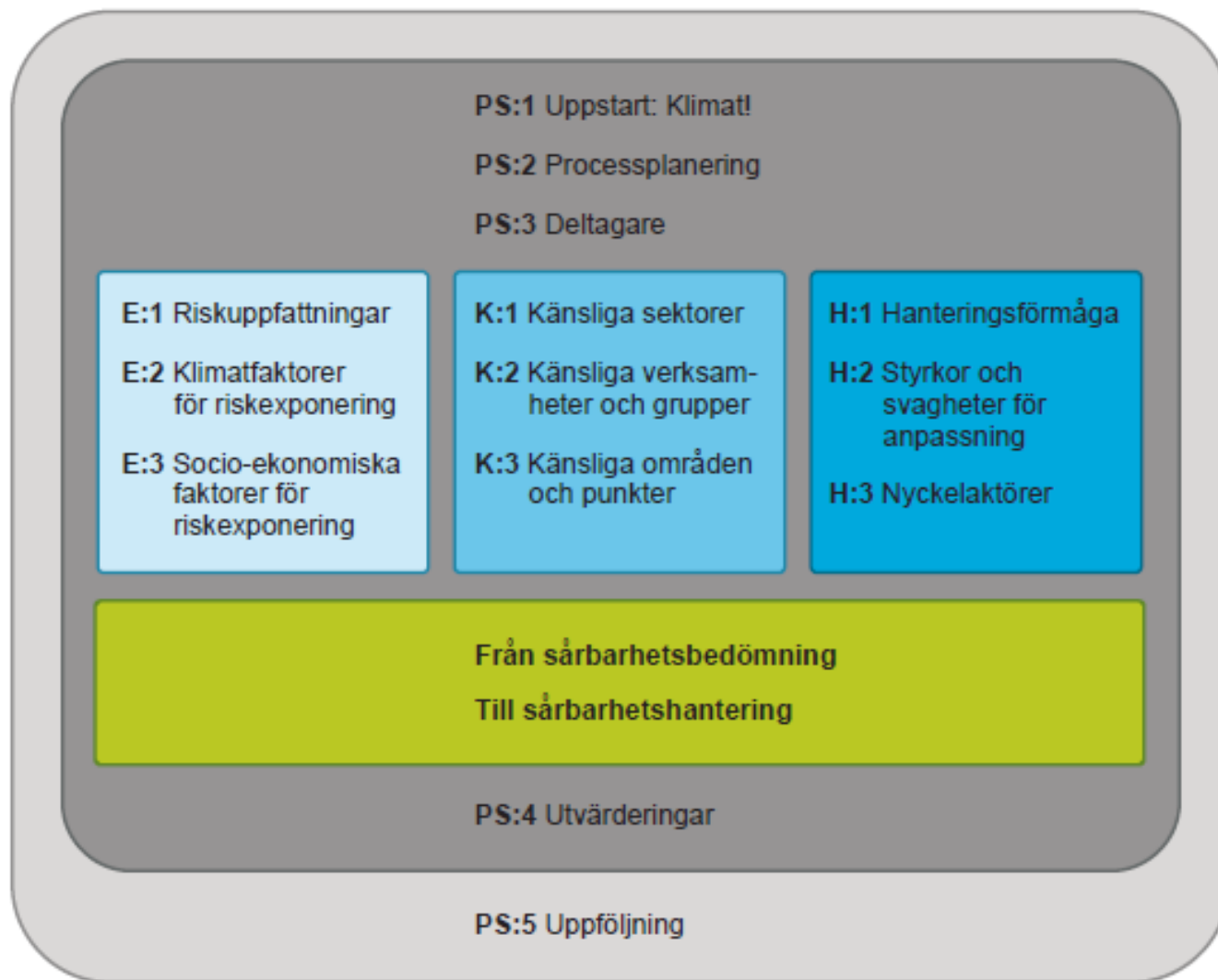
a combination of
exposure, sensitivity and
adaptive capacity
to various risks

Vulnerability and adaptation to climate change



Figur 1. Analytiskt ramverk för integrerad sårbarhetsbedömning (baserad på Fussler och Klein, 2006).

Toolbox – Swedish version (2011)



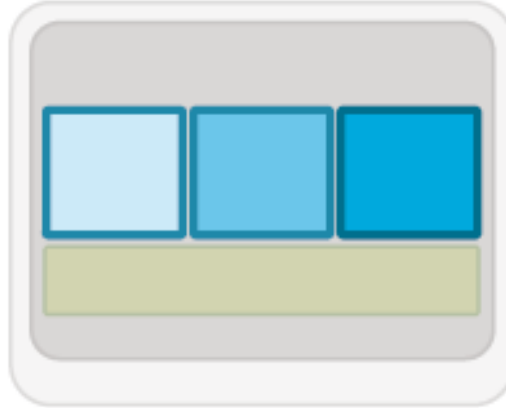
A Guidebook for Integrated Assessment and Management of Vulnerability to Climate Change (Wilk et al 2013)

www.cspr.se

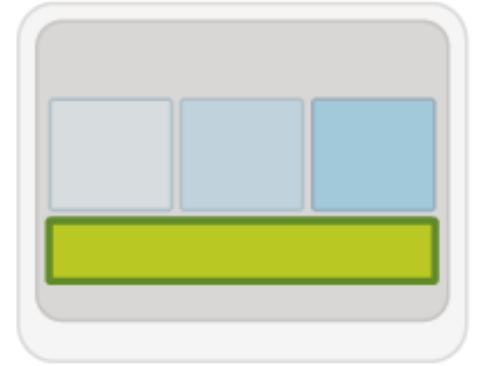
Getting started



Assessing vulnerability



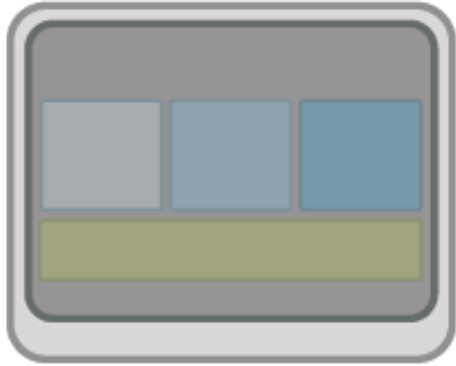
Managing vulnerability



The toolbox helps to...

- Scan the most important vulnerability factors
- Sift mosquitoes from elephants without drowning in information on specific conditions
- Identify need for more data
- Identify the adaptation measures, both “soft” and “hard”
- Understand how climate change interacts with social change
- Identify which places, sectors, activities and groups that are vulnerable

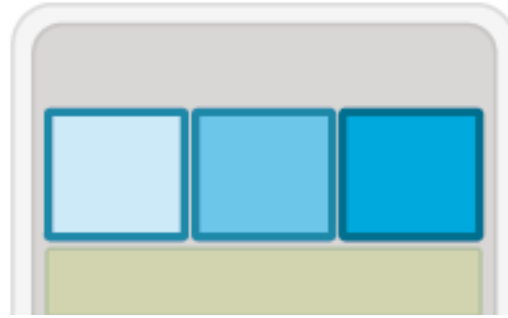
Getting started



The process is based on a sequence of participatory exercises that facilitate a structured analysis of vulnerability across three dimensions: exposure, sensitivity and adaptive capacity.



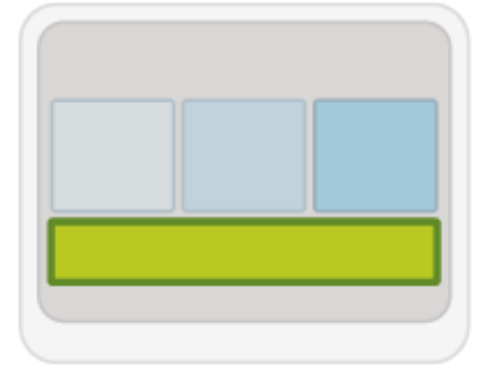
Assessing vulnerability



It combines qualitative and quantitative approaches to vulnerability assessments.

Managing vulnerability

The process culminates in a concrete action plan outlining steps for implementing strategic actions including clear delegation of responsibility and realistic time plans.



	Viktigaste faktorema som bestämmer sårbarhet	Vad kan göras för att hantera sårbarhet?	Vem kan göra det?
Exponering	E:1,2,3		H:3
Känslighet	K:1,2,3		H:3
Hanterings- förmåga	H:1,2		H:3

Spinn-offs?

Designing climate-smart water adaptation strategies

Kota, India and Cochabamba, Bolivia

2012-2014



Kota, India

Population: 1,500,000

Rajasthan



Cochabamba, Bolivia

Population: 1,000,000



Workshop sequence in India

WS1

Challenges
and Chances

WS2

Handling
Climate
impacts

Local
Sensitive
Groups

WS3

Facilitating
factors and
barriers,
synergies
and
conflicts

Step by step
action plan

A process for co/learning on climate change and its effects



Cause

Problem

Remedy

Open dam
barrages

Heavy rain

Construction
in flood prone
areas

Blocked
nallas

Urban
sprawl

Hard
surfaces

Land value

Flood

Insufficient
urban
greenery

Side effects

Water
returning
walls

Diversion
channels

Cleaning
nallas

Heat
tolerant
plants

Plantation
along roads

Careful dam
opening

Early
warning

Pacca nallas

6% green in
all areas

Roof-top
horticulture

Plant
distribution

+Reduced heat

-Reduced groundwater recharge

Toolbox soon at Swedish
Climate Adaptation Portal

[http://www.klimatanpassning.
se/atgarder-beta](http://www.klimatanpassning.se/atgarder-beta)

Toolbox used by Norrköpings municipality in the Decision Arena at LiU

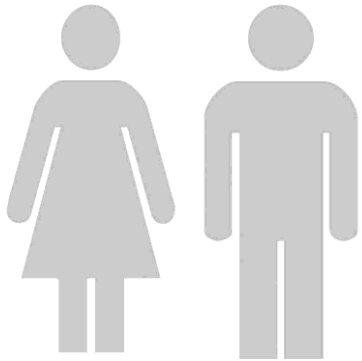




THANK YOU!

Thank you!

anna.c.jonsson@liu.se



Jonsson and Lundgren (2014).
Vulnerability and adaptation to heat in cities: Perspectives and
perceptions of local adaptation decision-makers in Sweden.
Local Environment.



Centre for
Climate Science
and Policy Research
www.cspr.se

Introduction:
climate change and
its effects

Existing checklists
and guides

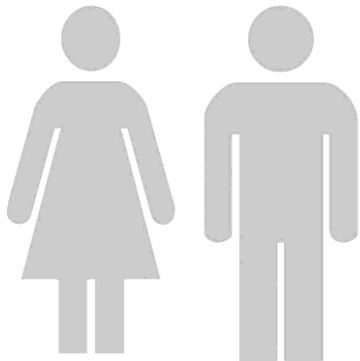
Heat wave
warnings



3+3-hours training of care team

(elderly, ill, children)

in April/May



Awareness
Increased knowledge

Vulnerability profile
for each patient

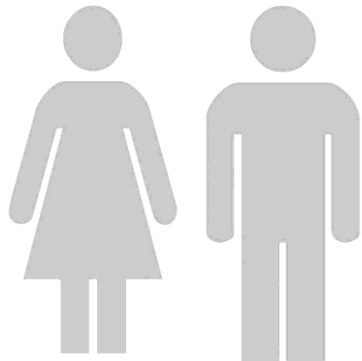
Adapted routines
and checklists

Introduction:
climate change and
its effects

Available data on
local impacts

Available data on
vulnerable groups

Available
recommendations on
heat stress prevention
measures



3+3-hours training of urban planners in connection to new master plan, MP



Awareness
Increased knowledge

Identification of
hot spots

Integration of heat
stress prevention
measures in MP