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# The fair distribution of flood risk in urban areas

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# Urban flood management

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Increasing **urbanisation** + impacts of **climate change**  
+ deteriorating **infrastructure**  
= Increasing **risk of floods**

# Sustainable Urban Drainage Systems (SUDS)

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12/05/2017

2017 Ontario Climate Symposium

Photos from:  
<http://tour.thelivingcitycampus.com>



# Barcelona

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# Barcelona

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Djordjevic, S. 2014. Collaborative Research on Flood Resilience in Urban Areas – Project Final Report. Contract 244047, [www.corfu7.eu](http://www.corfu7.eu)



# Barcelona



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# Current approach

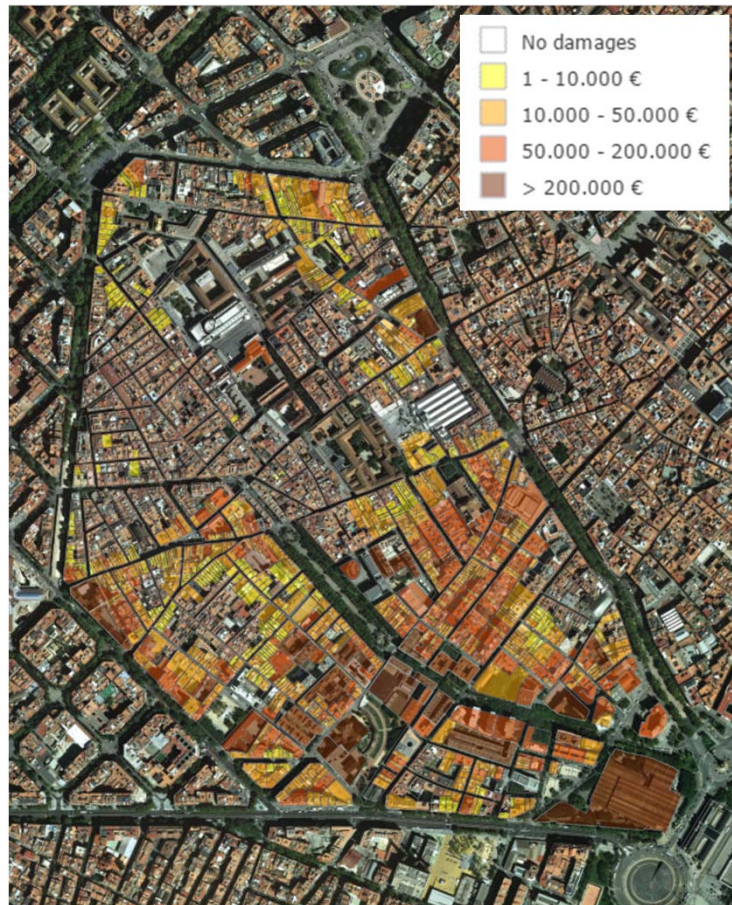
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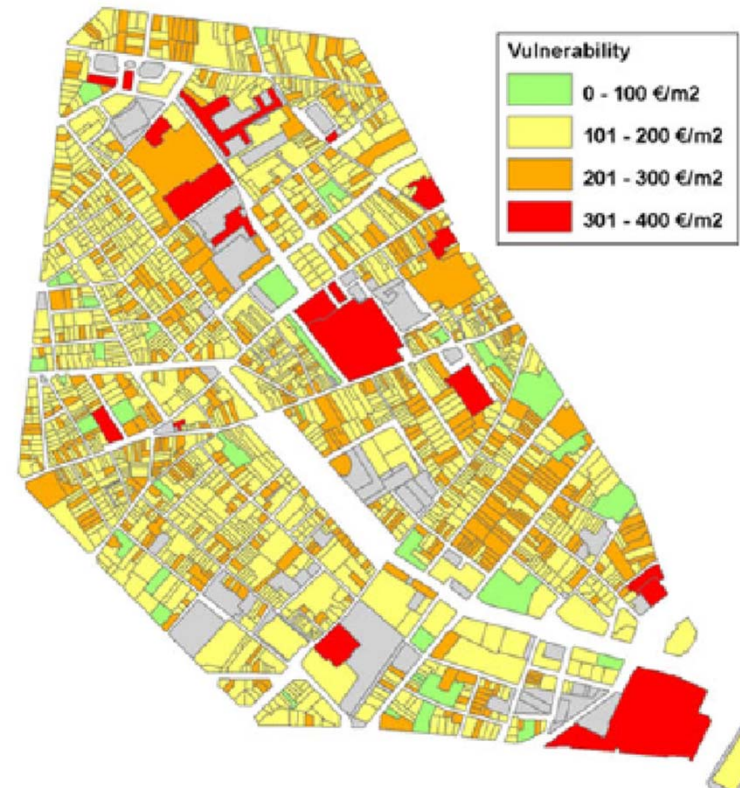


# Current approach: Cost-based

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Djordjevic, S., 2014. Collaborative Research on Flood Resilience in Urban Areas – Project Final Report. Contract 244047, [www.corfu7.eu](http://www.corfu7.eu)



Velasco, M. et al. 2016. Flood damage assessment in urban areas. Application to the Raval district of Barcelona using synthetic depth damage curves, *Urban Water Journal*, 13(4).



# Criticisms

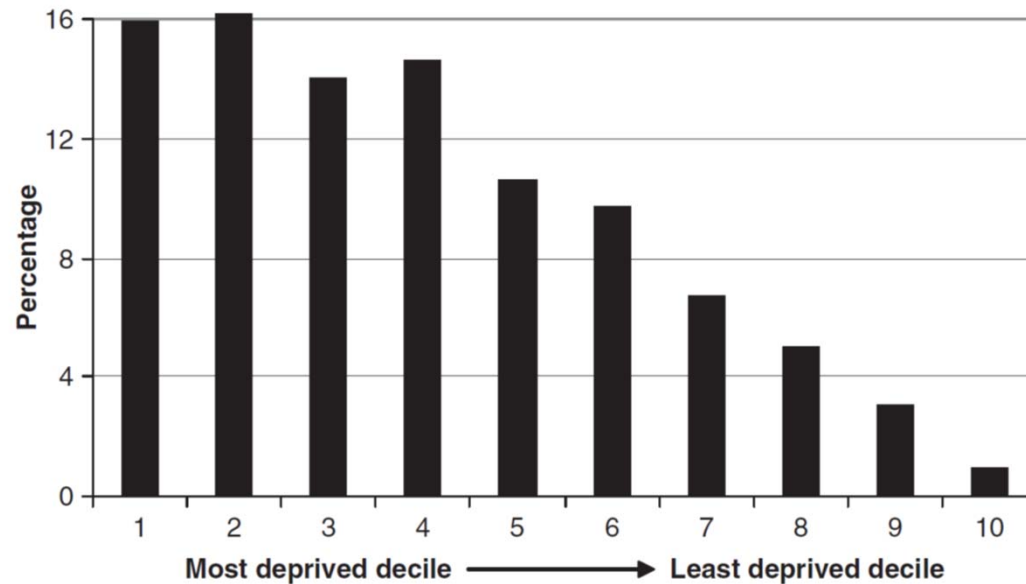
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National	“Targeting the most vulnerable and delivering procedural equality is not the aim here... utilitarian considerations therefore dominate these decisions ...” p 379
Regional	“...dominantly utilitarian approach...” p 380
Local	“The dominant criteria used in the decision making process remain unambiguously designed to maximize utility.” p 381

Johnson et al. (2007)

# Criticisms

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**Figure 3** Percentage of total population within flood risk zone for sea flooding by deprivation decile

Source: Adapted from Walker et al. (2006).

## Vulnerability

- Variations in how impacts of risk are experienced by individuals
- Track demographic, socioeconomic, & cultural groups affiliation
- Intersectional concerns
- Dynamic rather than static

Walker & Burningham, 2011

## Environmental Injustice



# Distributive Justice

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Who...	...gets how much...	...of what?
<i>Scope</i>	<i>Profile</i>	<i>Currency</i>
Local Regional Sectoral National International	Utility Equality Priority	Resources Welfare Capabilities

# *Disadvantage* - Wolff & De-Shalit (2007)

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**Functionings** are about the many things 'a person is able to do and be' (e.g. healthy, socially connected, mobile), and have the following qualities:

- **Opportunities**, part of a wide array of possible choices one has control over
- **Genuine**, in pursuing the functioning, one does not need to bear unreasonable cost.
- **Secure**, the functionings can reliably be achieved over time.



# *Disadvantage* - Wolff & De-Shalit (2007)

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Integrate **vulnerability** into their account of **disadvantage**:

Exceptional risk and vulnerability is itself a disadvantage, whether or not the feared event actually happens. p 9

# SUDS can fulfil the following secure functionings

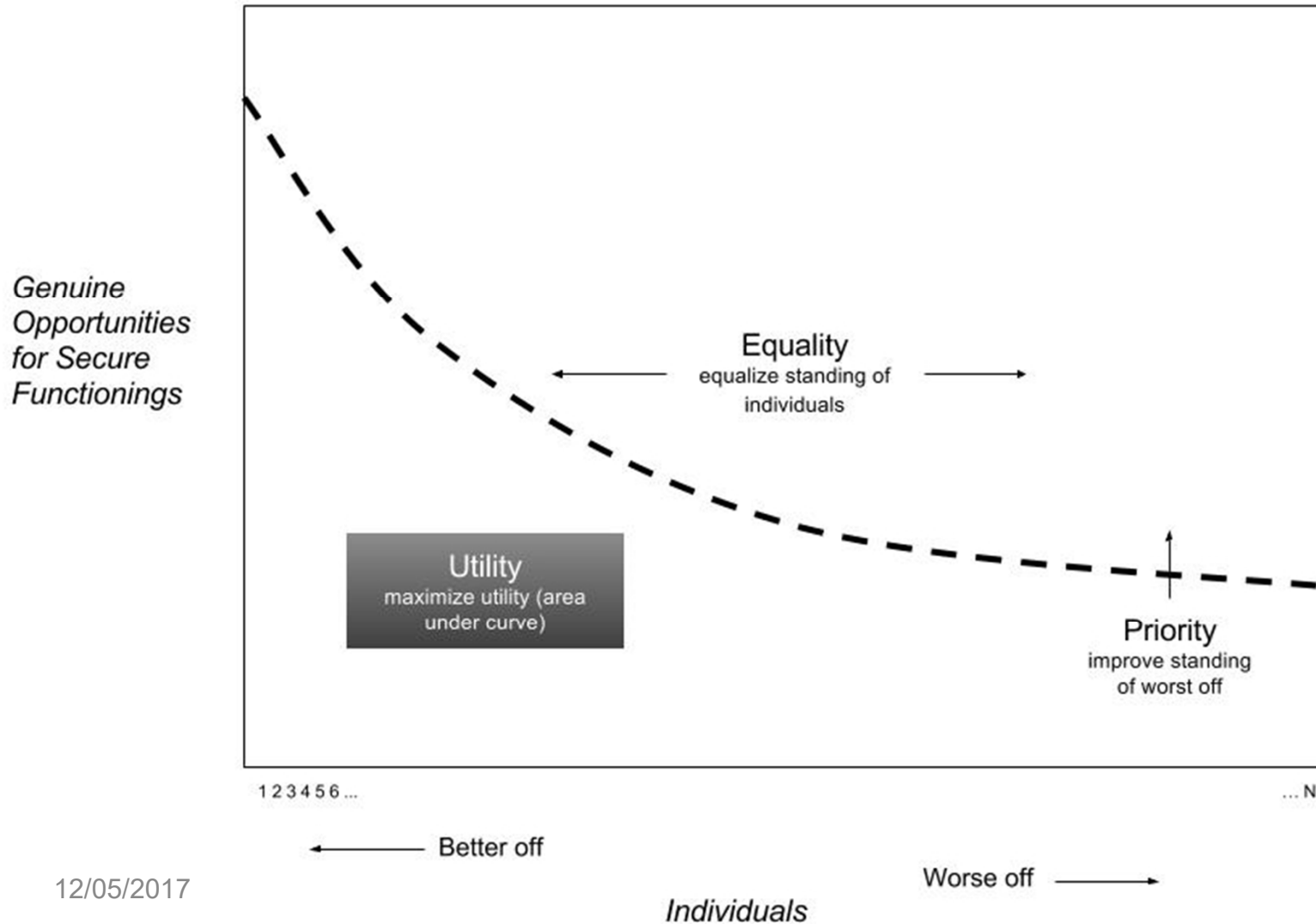
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<b>Secure functioning</b>	<b>Example of SUDS</b>
Life	Reduce death due to floods
Bodily health	Reduce exposure to or spread of waterborne diseases
Bodily integrity	Mobility; Promotes active transportation through <i>complete street</i> design
Affiliation	Increases access to shared green spaces & parks
Nature	Increase vegetation & wildlife in communities
Play	Increase access to green spaces & parks



# Profiles

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# Objective

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Using Wolff and De-Shalit's policy framework:

- Genuine opportunities for secure functionings

Applying three profiles of justice:

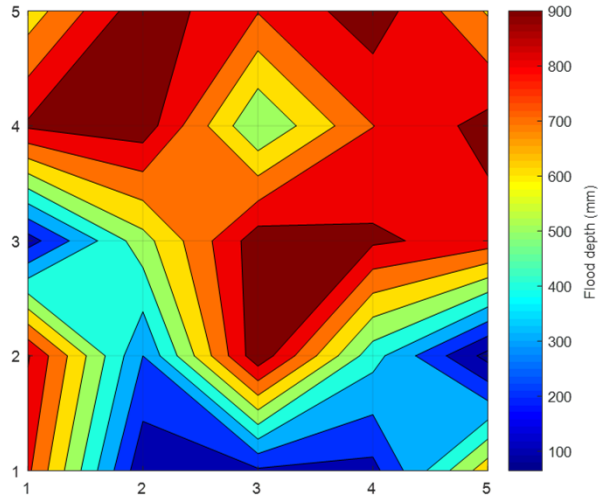
- **Utilitarian, Egalitarian, Prioritarian**

Comparing impacts on urban flood management

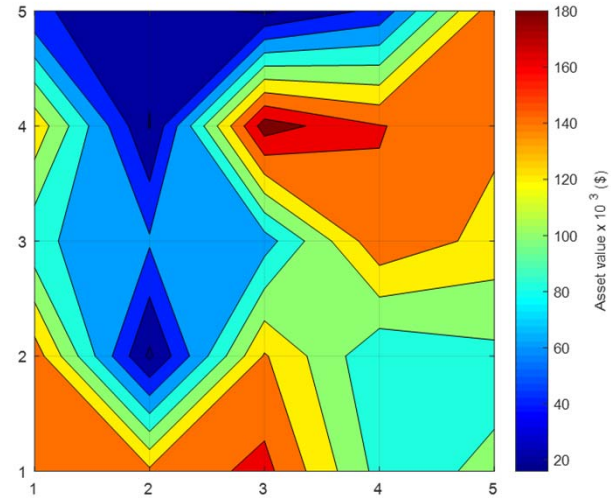


# Data

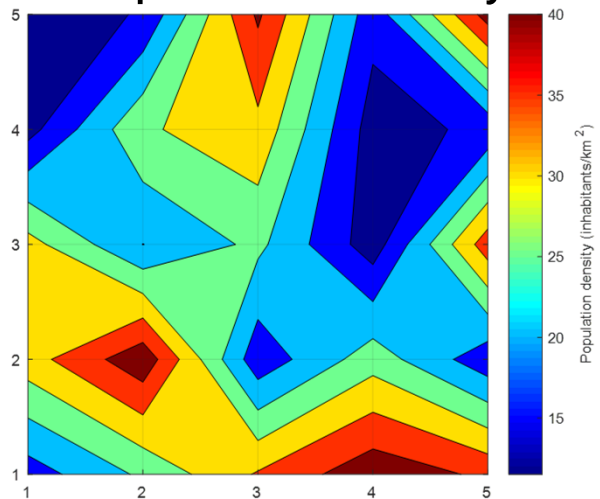
## Flood depth



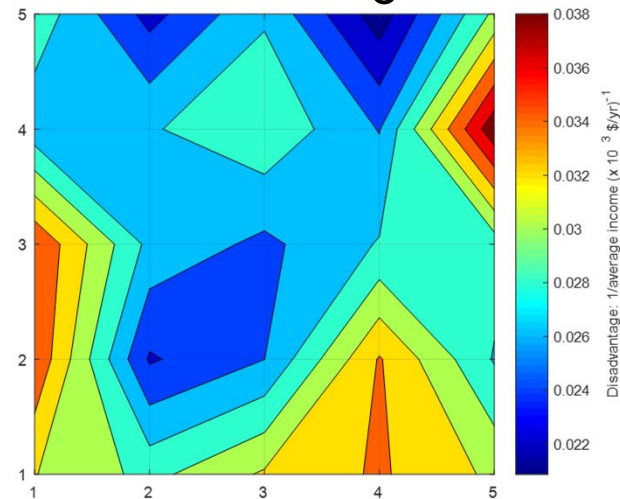
## Asset value



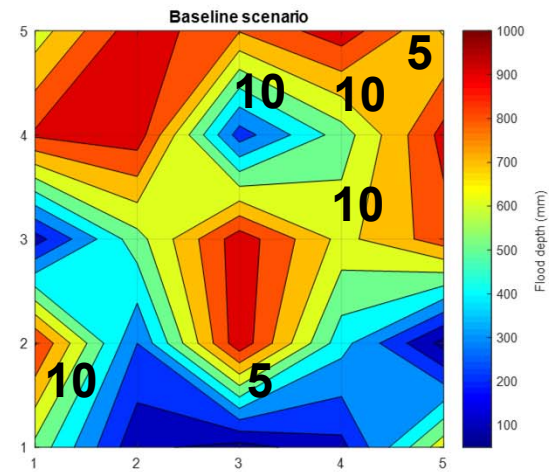
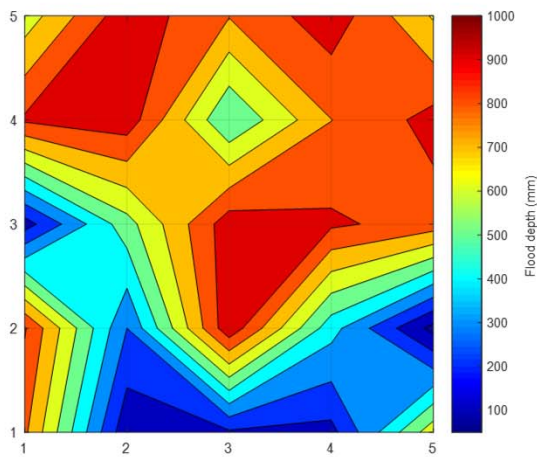
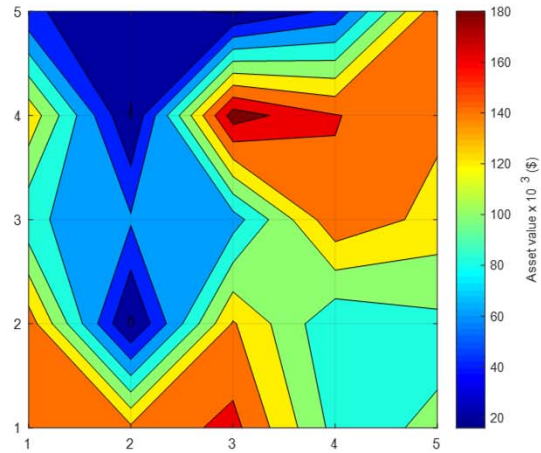
## Population density



## Disadvantage

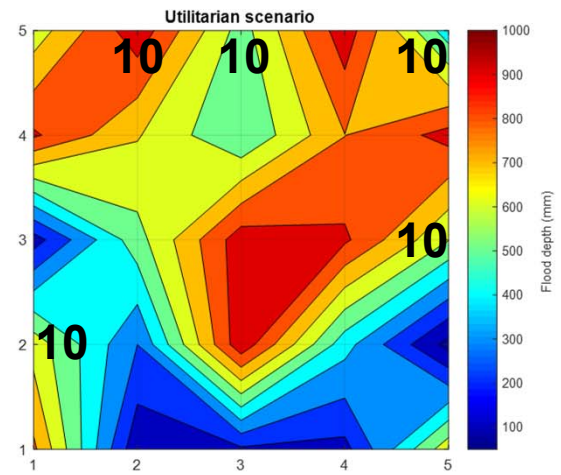
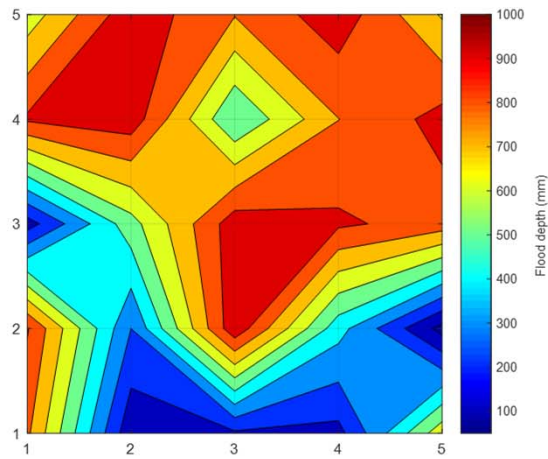
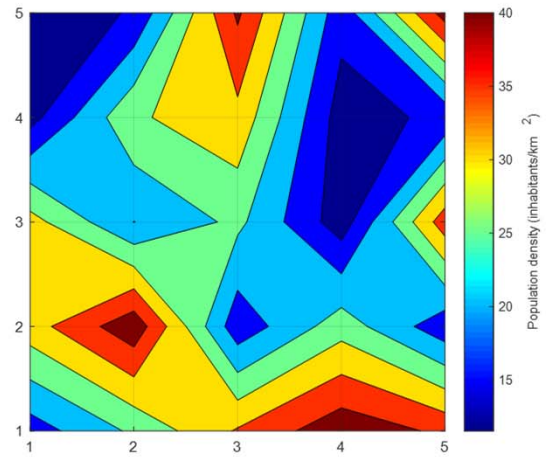


# Baseline scenario

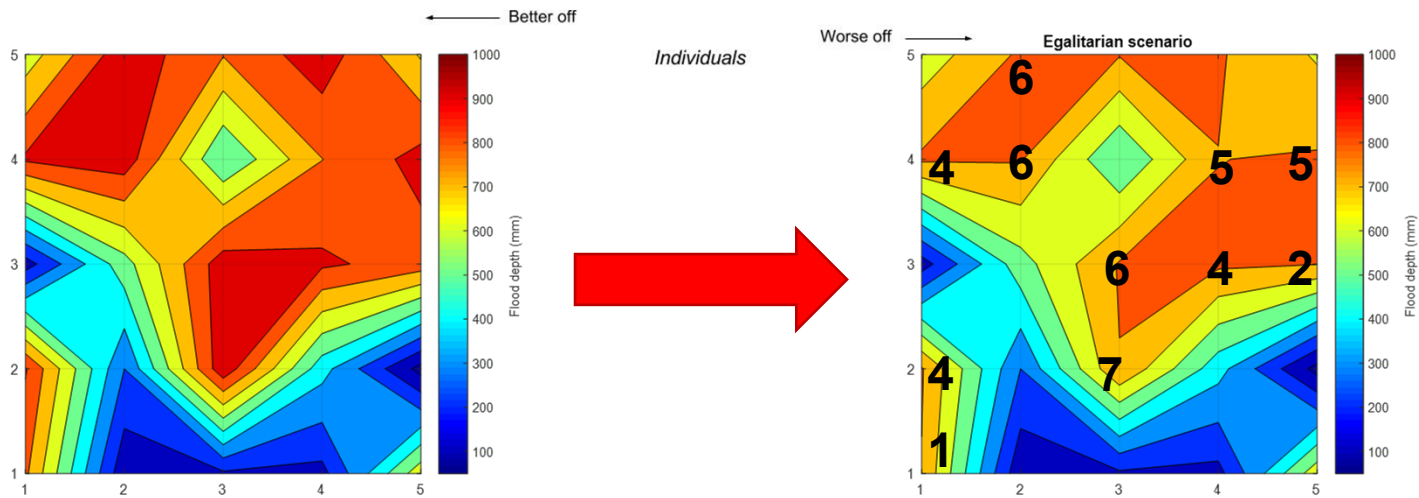
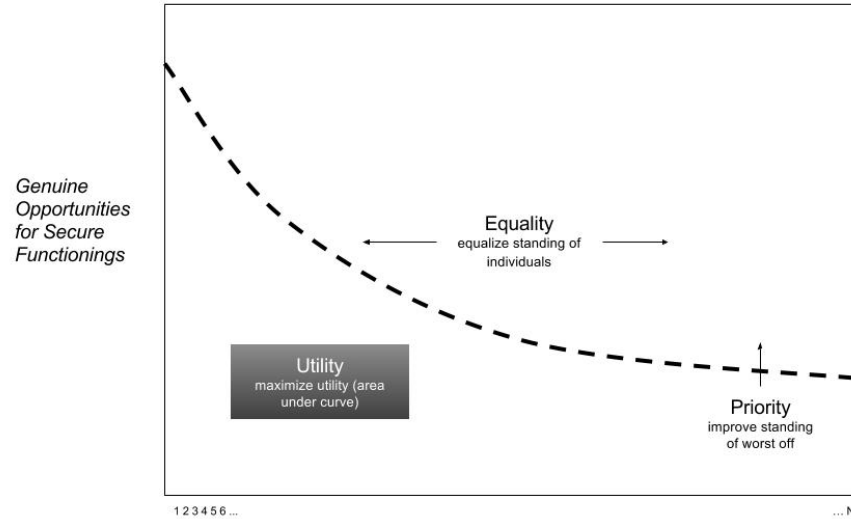




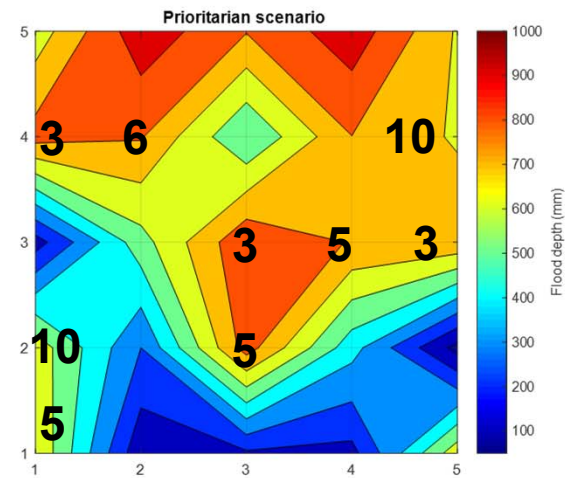
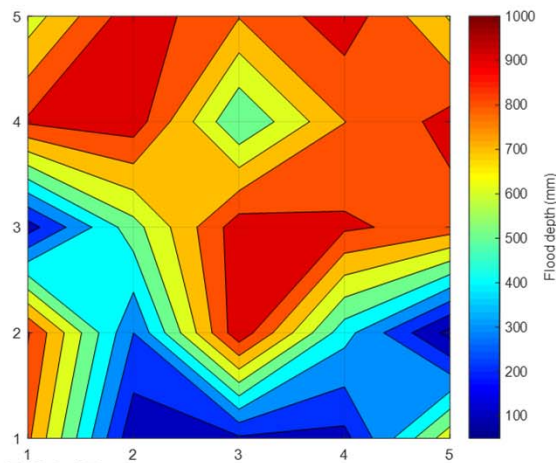
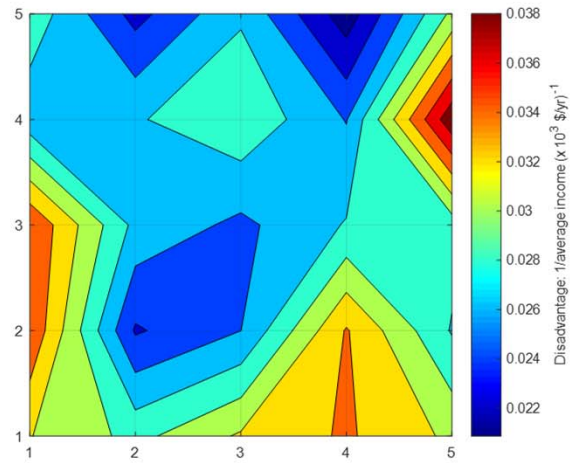
# Utilitarian



# Egalitarian

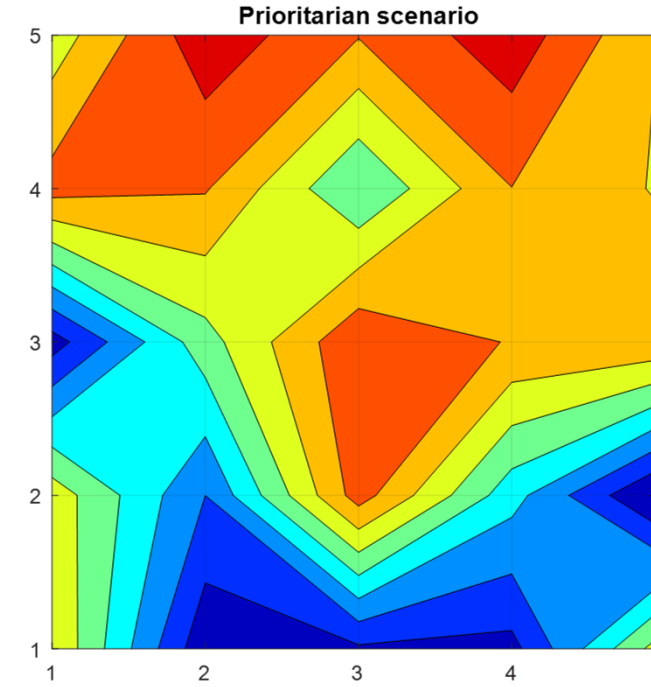
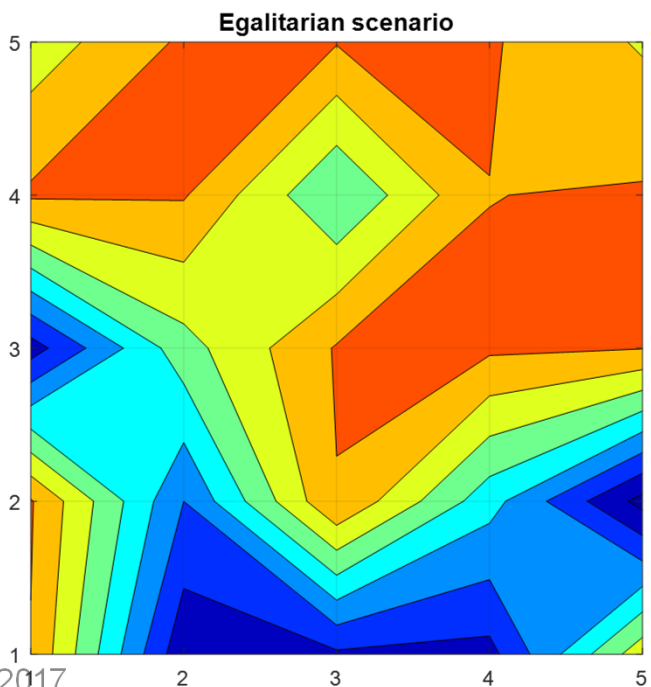
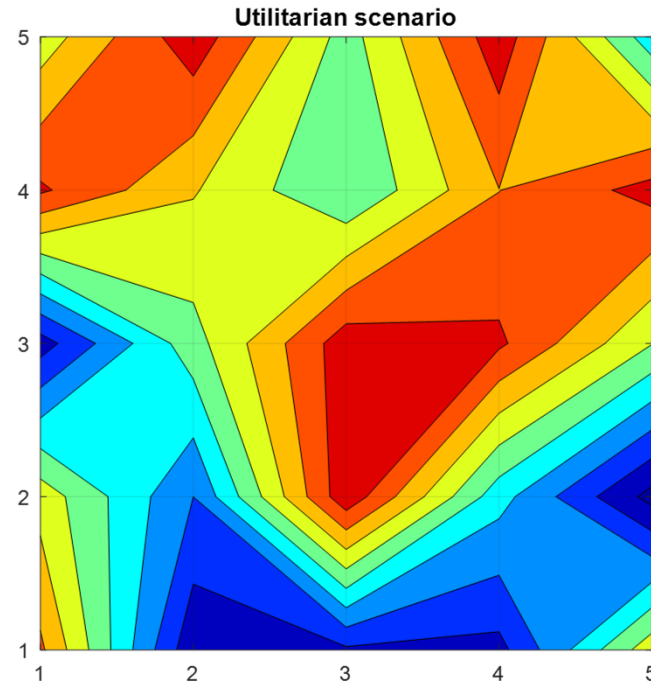
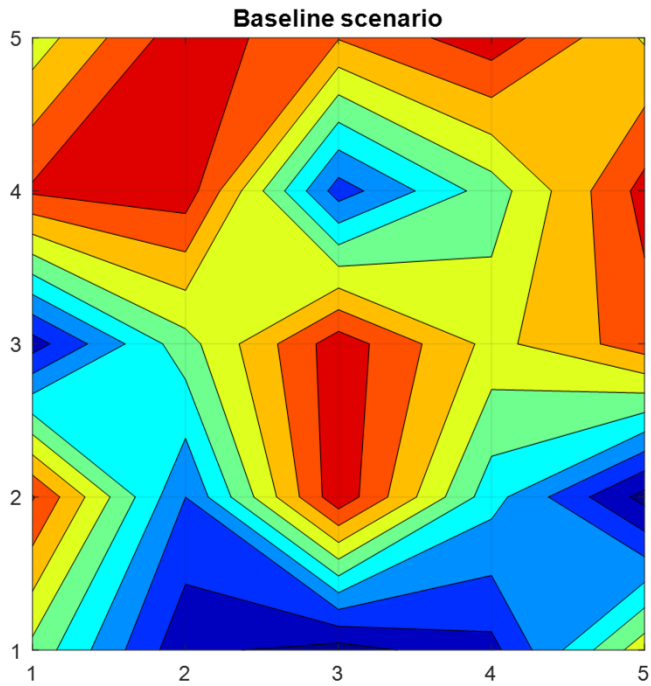


# Prioritarian



12/05/2017





# Recommendations

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- Greater consideration be made toward **egalitarian** & **prioritarian** distributions for urban flood management
- Wolff & De-Shalit's *genuine opportunities for secure functionings* view of the currency of justice be adopted

# Acknowledgements

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Dr Colin Farrelly (Queen's University)



# References

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Djordjevic, S. 2014. Collaborative Research on Flood Resilience in Urban Areas – Project Final Report. Contract 244047, [www.corfu7.eu](http://www.corfu7.eu)

Johnson, Clare, Edmund Penning-Roswell, and Dennis Parker. 2007. “Natural and Imposed Injustices: The Challenges in Implementing ‘fair’ Flood Risk Management Policy in England.” *Geographical Journal* 173 (4): 374–90.

Velasco, M. et al. 2016. Flood damage assessment in urban areas. Application to the Raval district of Barcelona using synthetic depth damage curves, *Urban Water Journal*, 13(4).

Walker, Gordon, and Burningham, Kate. 2011. “Flood Risk, Vulnerability and Environmental Justice: Evidence and Evaluation of Inequality in a UK Context.” *Critical Social Policy* 31 (2): 216–40.

Wolff, Jonathan, and Avner De-Shalit. *Disadvantage*. Oxford Political Theory. Oxford University Press, 2007.

# Standardised SUDS

- Vegetation based
- Can be retrofit into urban areas
- Sized to 10% of upstream impervious area
- Storage capacity of 25 mm
- Cover maximum 20% of total area

# Challenges

1. Distribution of disadvantage:
  - utilitarian, egalitarian, or prioritarian?
2. Spatial-person problem:
  - Distributive justice is a person-affecting problem.
    - From a philosophical perspective, what matters is how individual people are faring under the distributive scheme.
  - Infrastructure planning is a spatial problem.

Policy decisions should be transparent about how they handle the transition between the two paradigms.



# Spatial-person challenges

Q: How have we handled the transition between the spatial and person-affecting paradigms?

A: Individuals are grouped into spatial cells

Weaknesses	Strengths
<p>Omits:</p> <ul style="list-style-type: none"><li>• Intra-group (dis)advantage measurements</li><li>• Demographic information</li><li>• Human mobility patterns</li></ul>	<p>Computational simplicity Ease of data access (privacy concerns)</p>

# Future work

- Urban & economic growth models
- Identifying the types of data that needs to be collected to better address the spatial-personal problem
- More distributive profiles e.g. sufficientarianism
  - Hybrid profiles (Equality / Priority)