Technische Universität Berlin

MCC Mercator Research Institute on Global Commons and Climate Change gGmbH

Making Urban Policies Sustainable

Long-term benefits of Urban Planning and Fiscal Policies

Blanca Fernandez Milan

Disputation

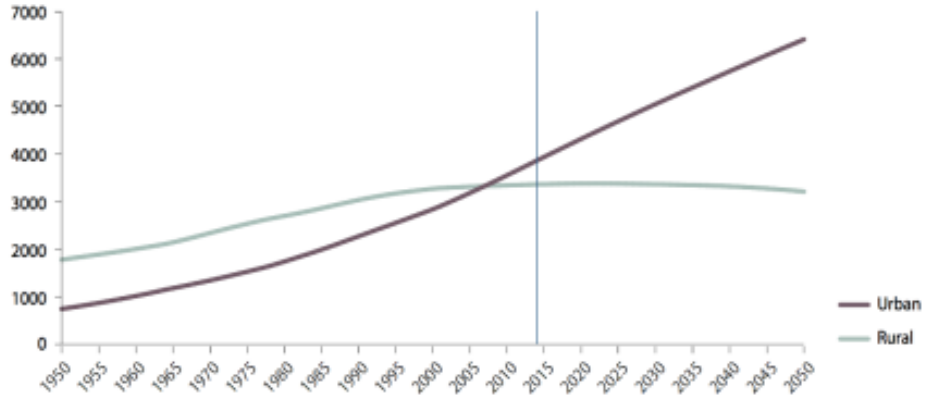
September 13, 2016

Starting point

Municipalities are confronting with conflicting objectives:

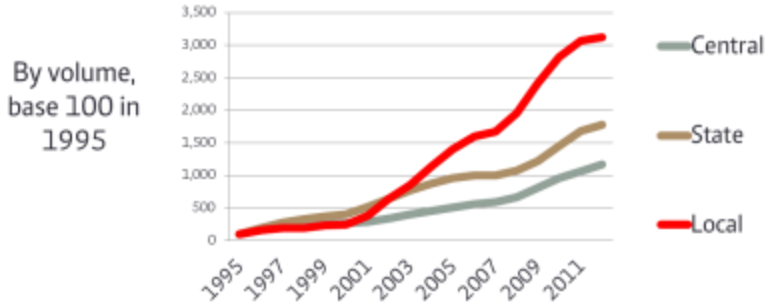
1 Finance urban infrastructure and services to ensure the long-term well-being of its citizens

Population trends (millions) (UN, 2014)



2 Stabilize public finances

Difference between revenues and expenditures for EU27 (cumulative index, in %) (Eurostat, 2014)



Research mostly focuses on only one objective

PhD contribution

I investigate the **interplay between policy instruments -fiscal policies and urban planning-** to achieve both objectives

We have

Different policy instruments

We want

Different objectives

- Low-carbon AND socially AND economically sustainable cities **for current and future generations**

PhD contribution

What is the **solution portfolio** for **long-term urban sustainability?**

- **Interdependencies** between different **sustainability policy agendas**
- **Strategies** better **achieve different objectives** simultaneously

How can **urban planning** and **fiscal policies** foster long-term urban sustainability?

- Stabilize local **budgets**, enhance fiscal **equity** and reduce **land consumption**

Which **governance practices** alleviate the complexity and degree of interdependence between different sustainability objectives?

- Through the facilitation of synergies
- Exploring the solution spectrum without compromising the legitimacy of the process

Research Questions

PhD structure

I. Introduction

II. Policy Portfolio for Urban Sustainability

Chapter 2: The Sustainable Development Goals (SDGs) and cities (Reckien et al., 2016 accepted)
Chapter 3: Broadening the Mitigation Spectrum (Creutzig et al, accepted)
Chapter 4: Aligning Policy Objectives through Urban Planning (Fernandez Milan and Creutzig, 2015)
Chapter 5: Combining objectives successfully requires Governance (Fernandez Milan, under review)

III. Urban Planning under Sustainability Objectives

Chapter 6: Urban Planning induced Distortions (Fernandez Milan and Creutzig, 2016b)
Chapter 7: Sustainable urban planning: location value taxes (Fernandez Milan and Creutzig, 2016a)

IV. Governance for Urban Sustainability

Chapter 8: Participative planning and Social Sustainability (Fernandez Milan, 2016)
Chapter 9: Participative planning and Social Capita (Fernandez Milan and Creutzig, under review)
Chapter 10: Stakeholder involvement in Sustainability Science (Mielke et al., 2016)
Chapter 11: Institutional barriers: Energy Transition in Europe (Creutzig et al., 2014)

V. Conclusion

Underlined: published or accepted for publication

Today's focus

I. Introduction

II. Policy Portfolio for Urban Sustainability

Chapter 2: The Sustainable Development Goals (SDGs) and cities (Reckien et al., Environment and Urbanization, accepted)

Chapter 3: Broadening the Mitigation Spectrum (Creutzig et al, Annu. Rev. Environ. Resour., forthcoming)

Chapter 4: Aligning Policy Objectives through Urban Planning (Fernandez Milan and Creutzig, Curr. Opp. of Env. Sust.)

Chapter 5: Combining objectives successfully requires Governance (Fernandez Milan, Sust. Cities and Soc., under review)

III. Urban Planning under Sustainability Objectives

Chapter 6: Urban Planning induced Distortions (Fernandez Milan and Creutzig, Land Use Policy)

Chapter 7: Sustainable urban planning: location value taxes (Fernandez Milan and Creutzig, Land Use Policy)

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Chapter 4
Aligning Policy Objectives through Urban Planning

Approach: **align** different **objectives** with **different instruments**

PhD rationale: Increasing body of urban sustainability literature from multiple fields
→ Motivation: combine and synthetize **knowledge** according to:
- **Objectives** (1, 2, 3, …)
- **Policy instruments** (A, B, C, …)

We select **2** types of **policy instruments** -(A) public health and risk reduction and (B) urban planning- to align **2 objectives** -reducing (1) intrinsic and (2) extrinsic heat-related risks-.

State of the art: Literature strands all contribute to alleviation options for urban heat wave health impacts, but rarely jointly evaluated.

Our approach
Evaluation of interventions:
- Reducing (extrinsic, intrinsic) heat-related risks under **effectiveness, efficiency,** and **equity** criteria.

Urban heat risks: influencing factors

Heat-related morbidity and mortality
Unequal distribution of risk

Urban population

Exposure

Susceptibility

Heat waves severity

Frequency, intensity, duration

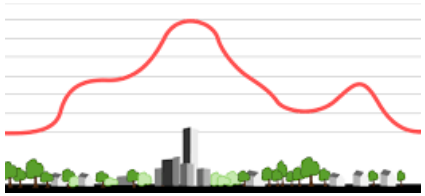
Extrinsic factors

Income
Education
Working &
living conditions

Intrinsic factors

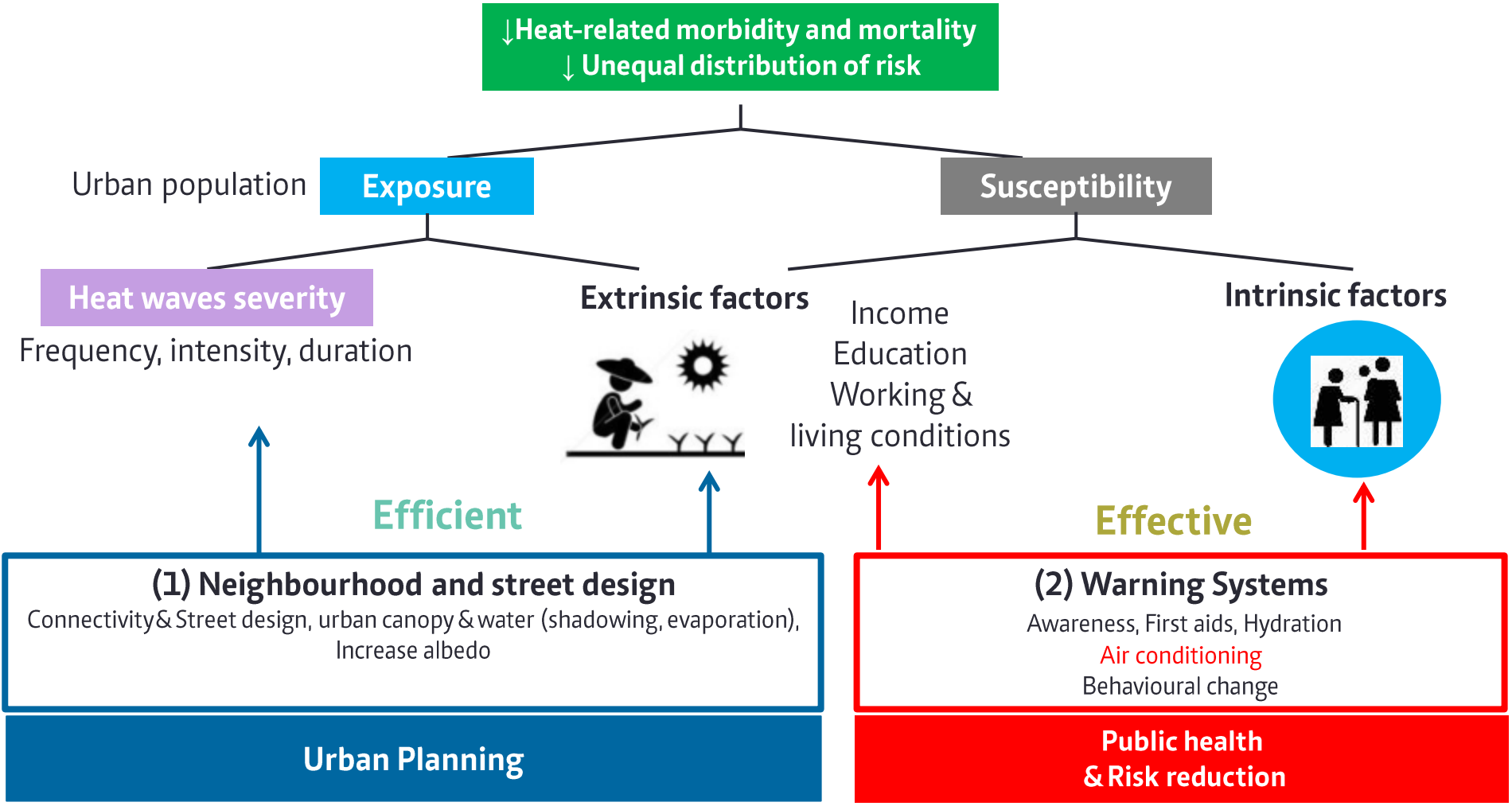
Age
Medical status

Urban Heat Island (UHI)



Cities heat up more than the surroundings
Anthropogenic heat: built-up density, transport networks, industrial activity, air quality, ...

Coordinated effort better address intrinsic and extrinsic factors



Chapter 4. Wrap-up

Chapter 4
Aligning Policy Objectives through Urban Planning

Combination of Public health, Risk reduction and Urban planning measures enhances response outcomes

- **Intrinsic factors** effectively addressed by public health and risk reduction intervention,
- **Extrinsic factors** can be efficiently tackled with urban planning, both in scale and scope.

Chapter 6
Urban Planning induced distortions

Approach: **evaluate** specific instruments for **different objectives**

PhD rationale: long-term urban sustainability includes multiple objectives.
→ Motivation: understand how **specific policy instruments affect different objectives in the long-term.**

We select **2 policy instruments** -(A) property taxes, and (B) land supply- to evaluate their effect on **2 objectives** -(1) low-carbon cities and (2) viability municipal budgets-.

State of the art: Literature lacks in:

a. Long-term perspective on the viability municipal budgets.
b. Comprehensive link between the 2 policy instruments and 2 objectives selected.

Our approach

a. Temporal **development property tax revenues** (transfers excluded)
b. Statistical evaluation using **urban economics** framework:
   - Control for urban economic drivers.
   - Provides a rationale to estimate the role of 2 policy instruments on 2 objectives.

Low-carbon cities → reduce "excessive land consumption" (named sprawl)

Costs of sprawl

- **Carbon-intense cities:** use of motorized modes, longer distances travelled (Cervero 2001; Creutzig et al. 2015).

- **Social segregation:** income inequality and urban decay in core areas (Brueckner and Helsley, 2011; Mieszkowski and Mills, 1993).

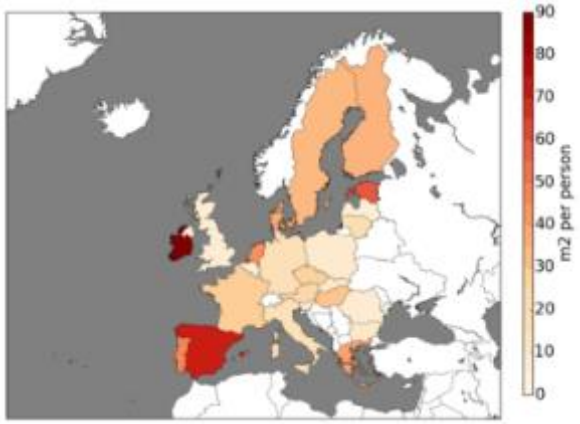
- **Rocketing expenditures:** Low-density development patterns lead to greater provision costs of local public services (Couch et al., 2007; Hortas-Rico and solé-Ollé, 2010).

Spain: Best "worse" practice on sprawl and local indebtedness

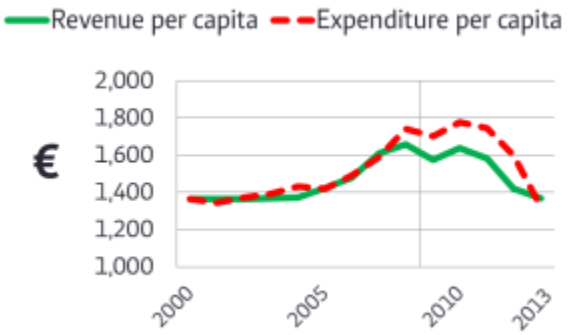
Excessive urban land consumption (sprawl)

2nd highest sprawl pattern in EU countries.

Urban surface per capita increased > 10% (2010-2012)
(Eurostat, 2013)

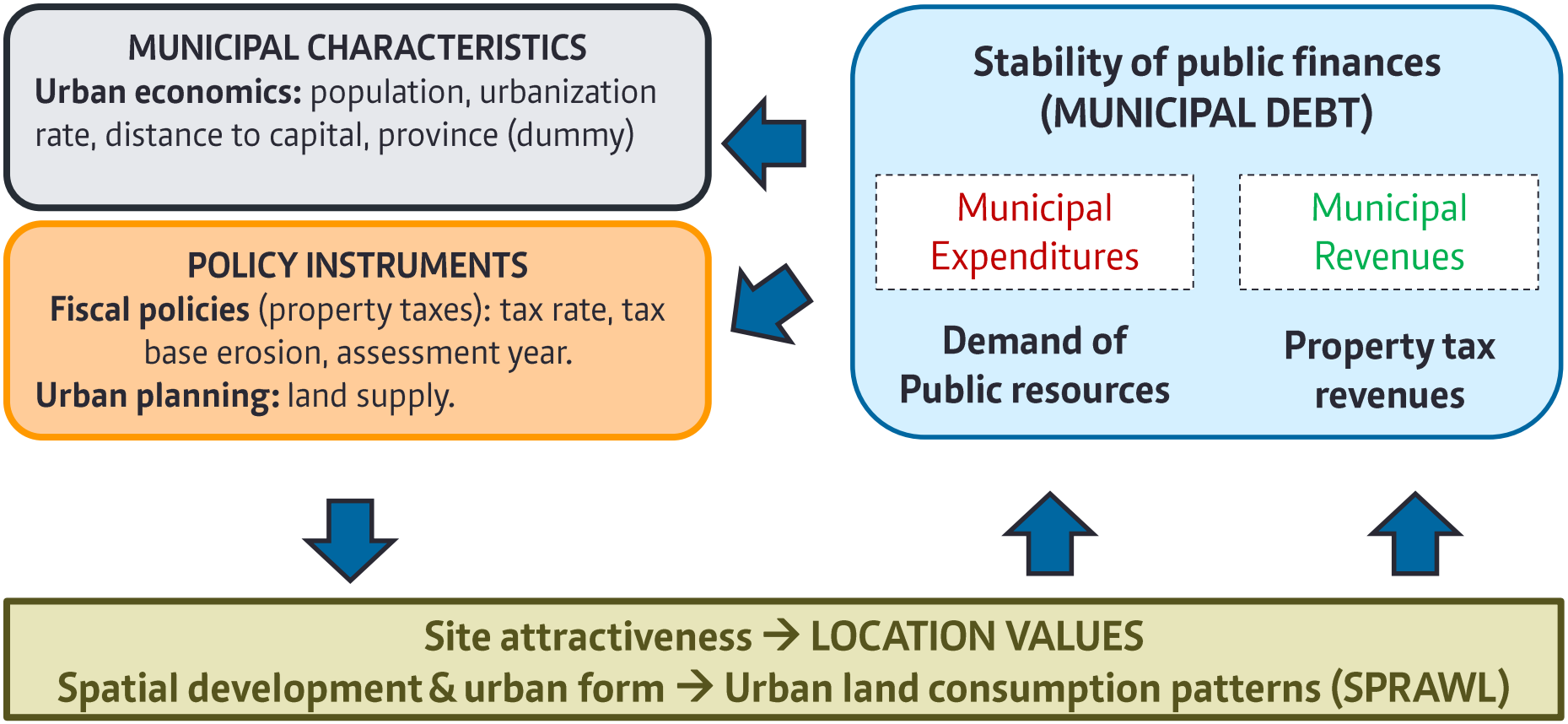


(Eurostat, 2013b)



→**Economic effects:** Highest increase in local indebtedness in EU countries.

The nexus between sprawl, indebtedness and location values



Permissive urban planning and tax-induced distortions accelerated urban sprawl and public debts in Spain*

Results based on a **regression analysis using framework of Urban Economics & Land taxation theory*
Sample = 265 municipalities

Sprawl was partially driven by:

- **cheap land supply in the suburbs** (Brueckner and Fansler, 1983, Mieszkowski and Mills, 1993)
- **public investment into urbanization infrastructure and services** (Hortas-Rico, 2014)
- **low tax rates** (Anderson 1986, Groves 2009) which then **lead to higher location values**

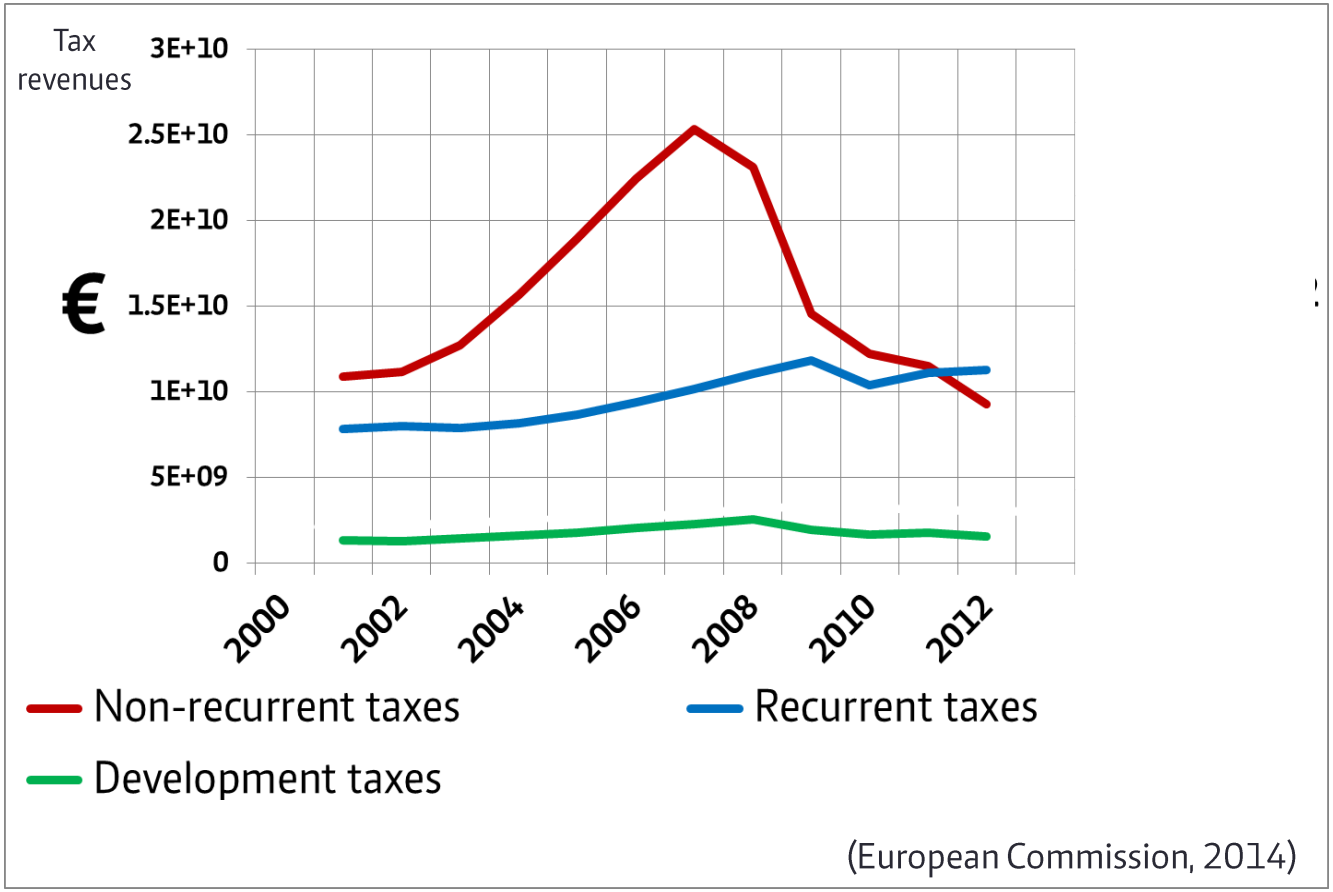
(Cocconcelli and Medda, 2013; Dye and England, 2009; Tideman, 1982).

Debt is partially explained by:

- **higher location values**
- **tax-induced distortions**

because value-creating decisions were only partially recaptured by taxes.

Property taxes: non-recurrent, recurrent & development taxes

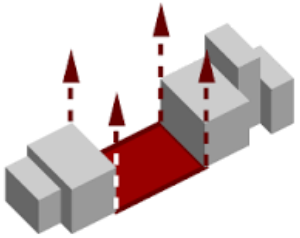


(European Commission, 2014)

non-recurrent

recurrent

development



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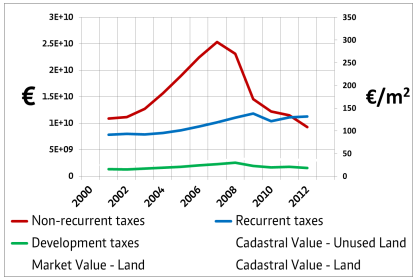
Policy instruments
Urban planning and property taxes



Chapter 6. Wrap-up

Chapter 6
Urban Planning induced distortions

The combination of permissive urban planning and tax-induced distortions accelerated urban sprawl and public debts in Spain.

- Municipalities learn to live on transfers and rezoning from rural/urban.
- Value-creating decisions (land supply for development and public investment) were capitalized on location values.

Chapter 7
Sustainable Urban Planning:
Location Value Taxes

Approach: **optimize** specific instruments for **different objectives**

PhD rationale: *Malperformance* of **policy instruments -**(A) property taxes, and (B) land supply- **on 2 objectives** -(1) reduce excessive land consumption and (2) viability municipal budgets-.

→ Motivation: identify **new policy instruments to achieve the objectives**

We select **1 policy instrument** -(C) Location Value Tax, LVT- and evaluate its effect on **3 objectives** -(1) reduce excessive land consumption and (2) viability municipal budgets and (3) fiscal equity-.

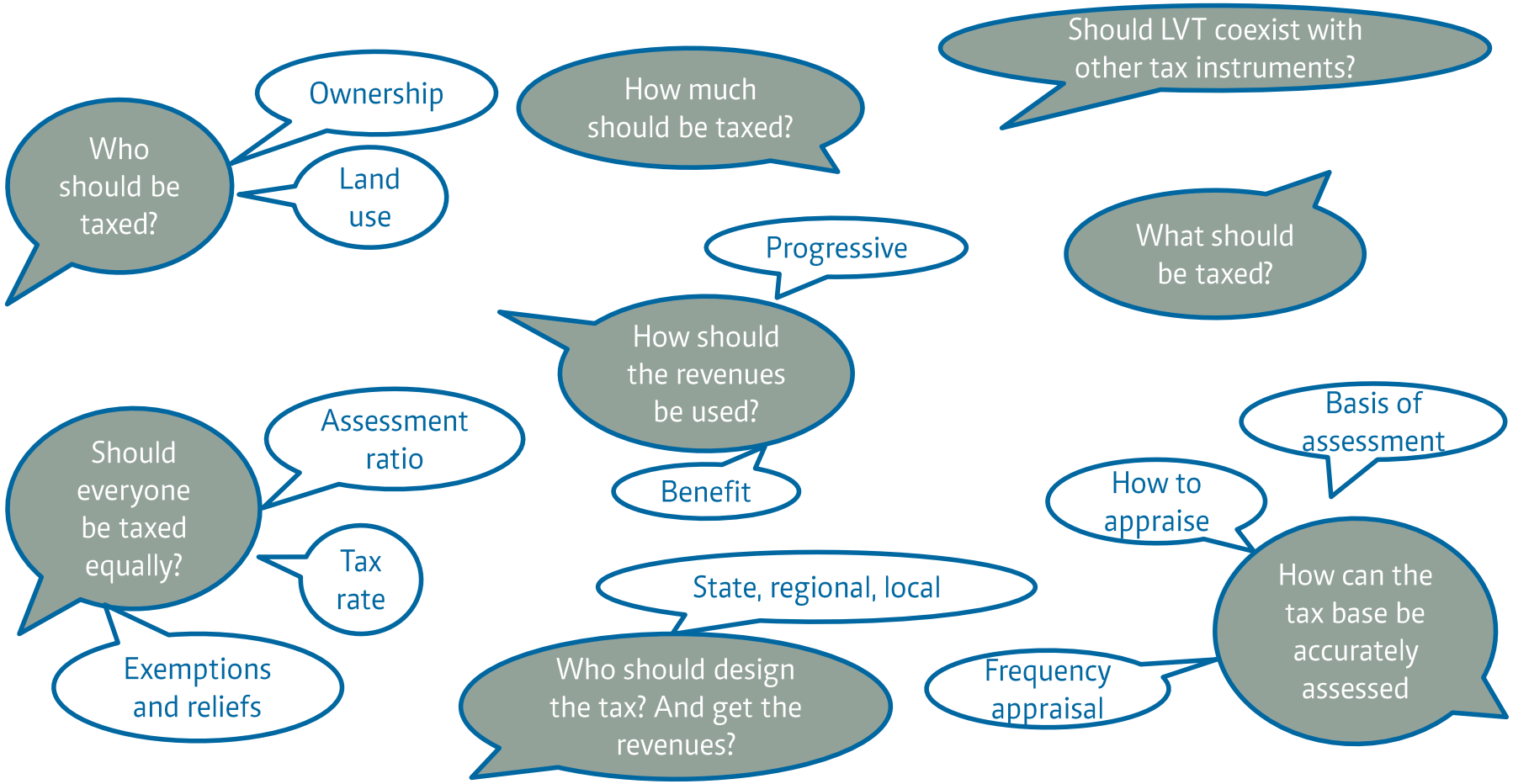
State of the art: Common consensus of the LVT benefits but two shortcomings appear in the literate:

a. Vague terminology disable useful comparisons between strands of literature.
b. Lack of holistic perspective that includes different objectives:
   - Efficiency/ equity/ sufficiency
   - Environmental effects (e.g. sprawl)

Our approach

We combine literatures on public finances, urban economics and value capture with that of sustainable urban planning to tackle this shortcomings.

Relevant characteristics of LVT design for urban sustainability



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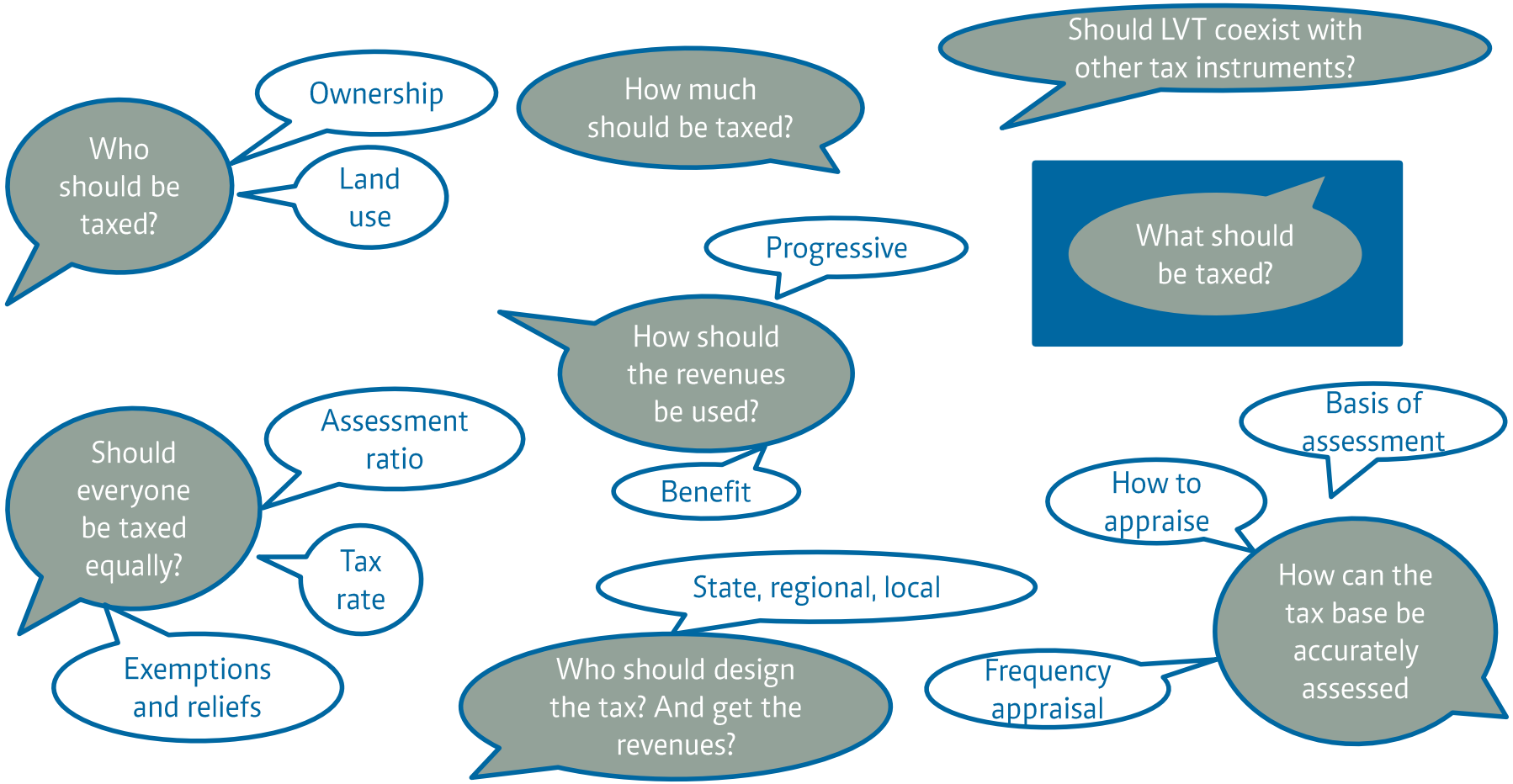
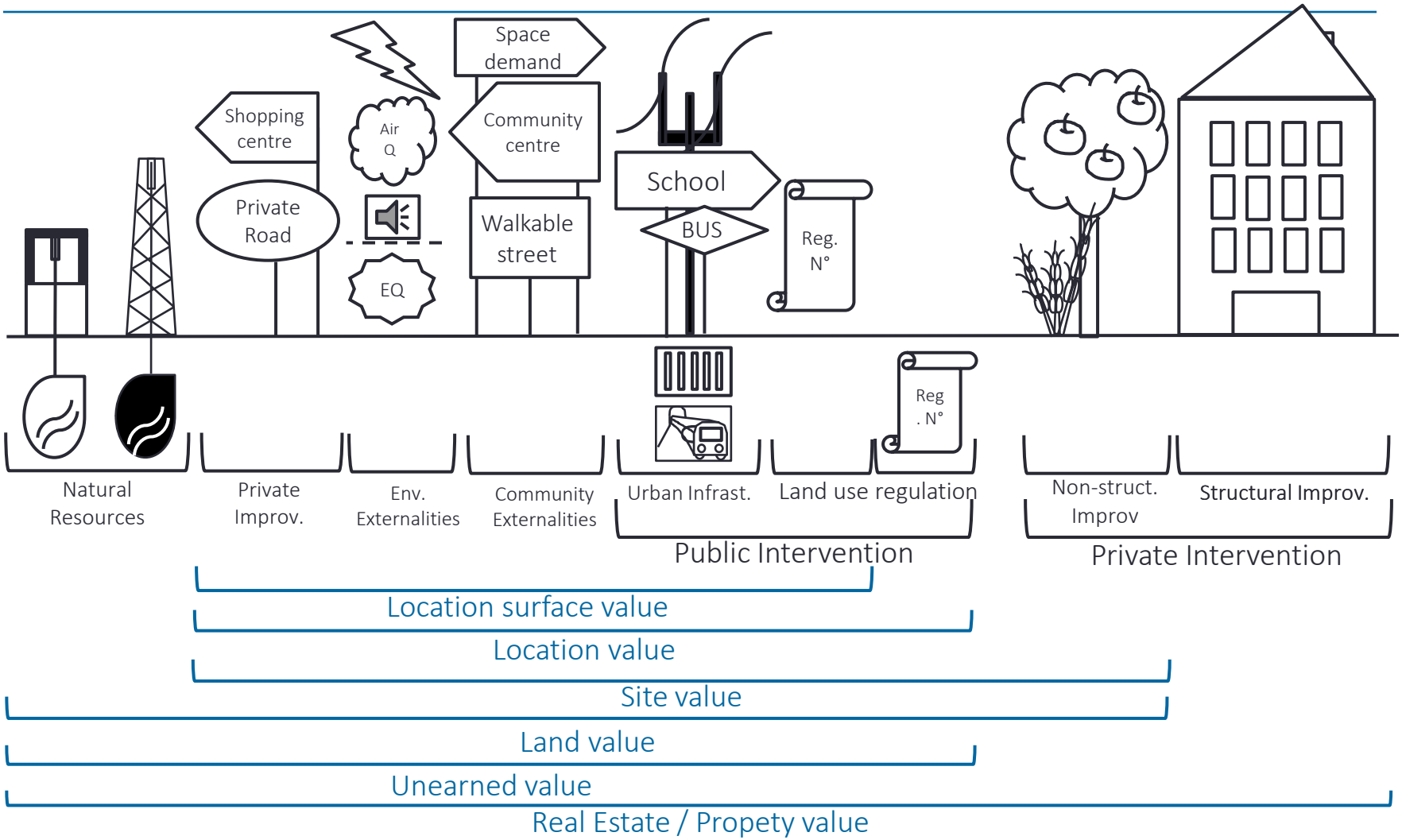
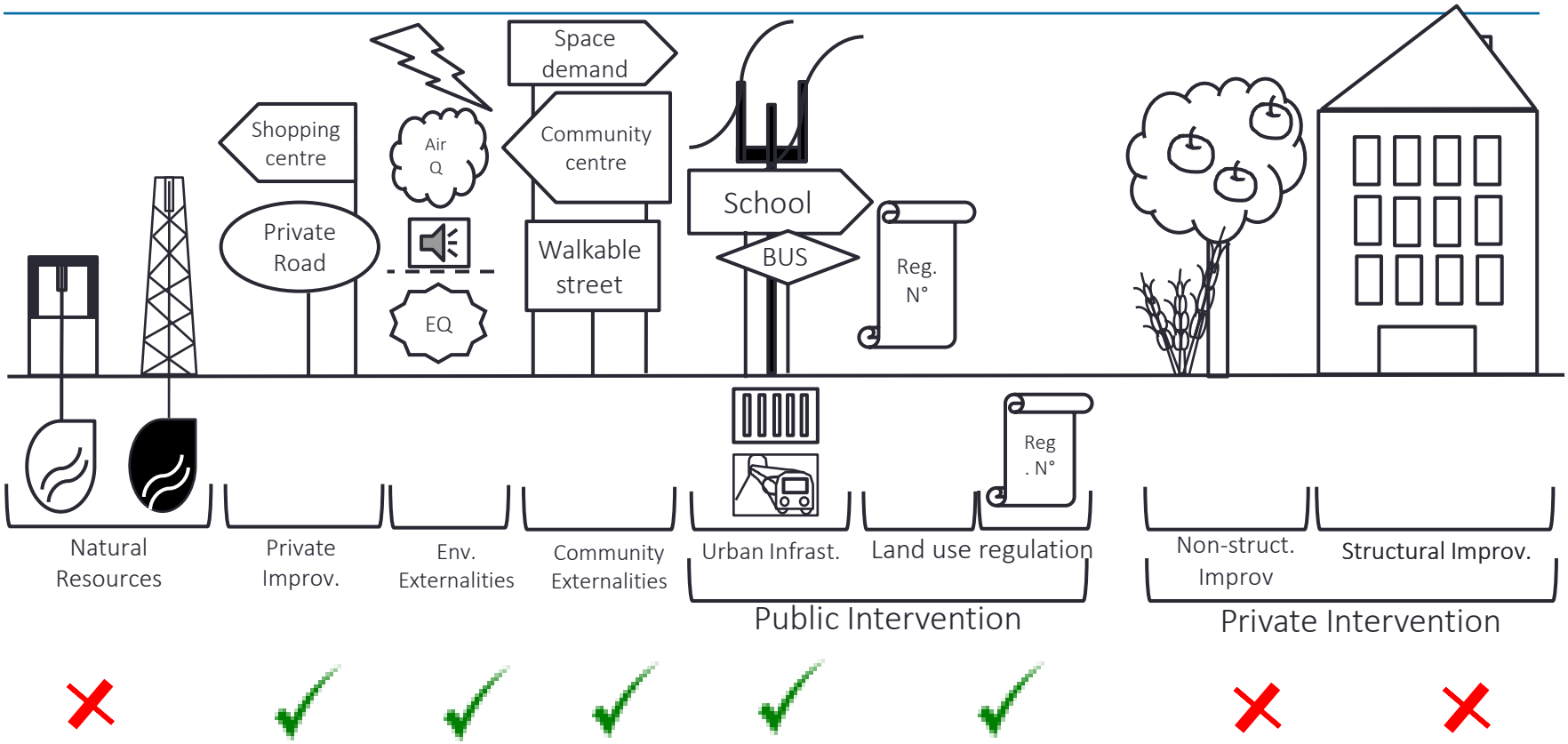


Factors influencing property values



What should be taxed: (1) reduce excessive land consumption and (2) viability municipal budgets and (3) fiscal equity.



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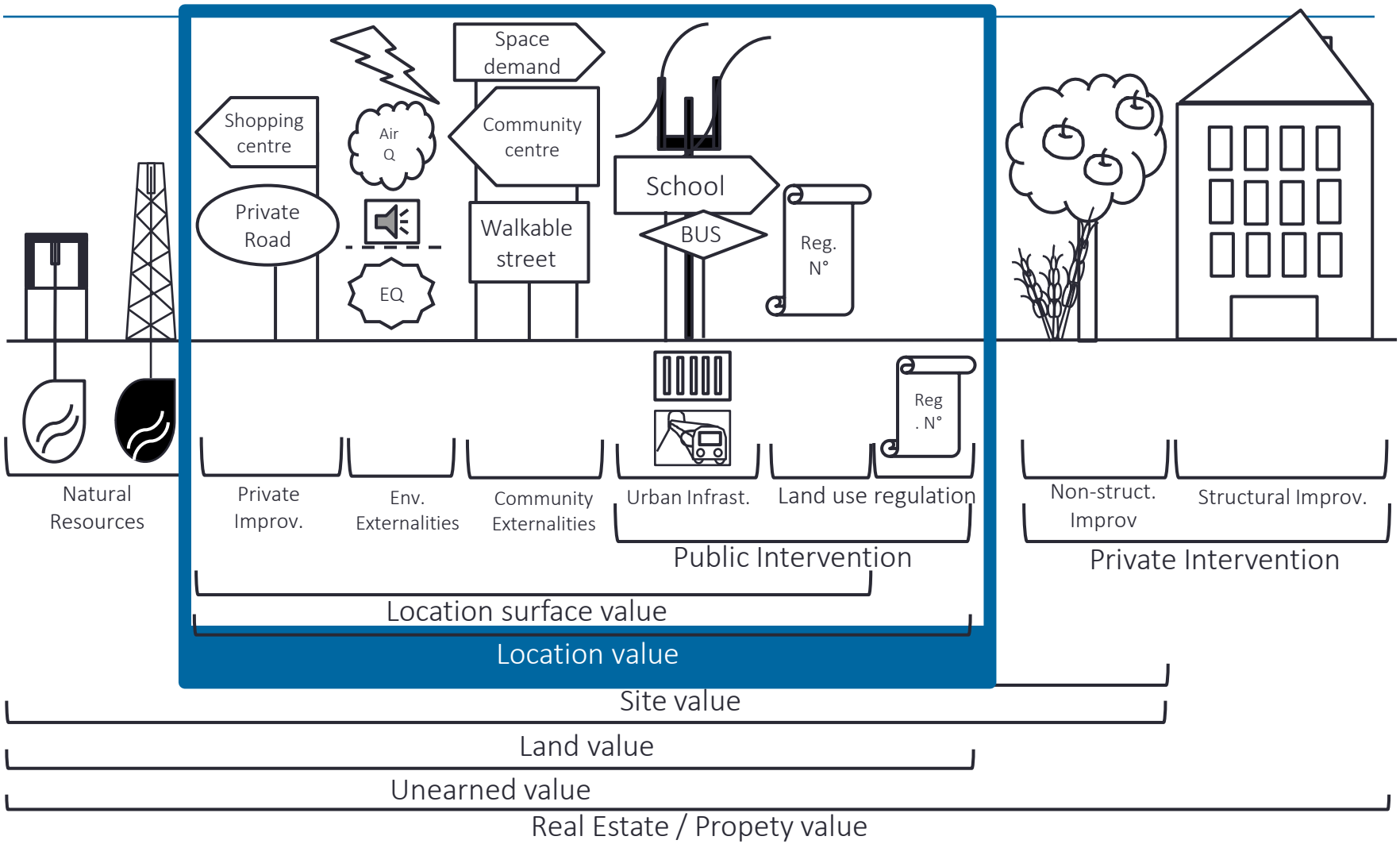
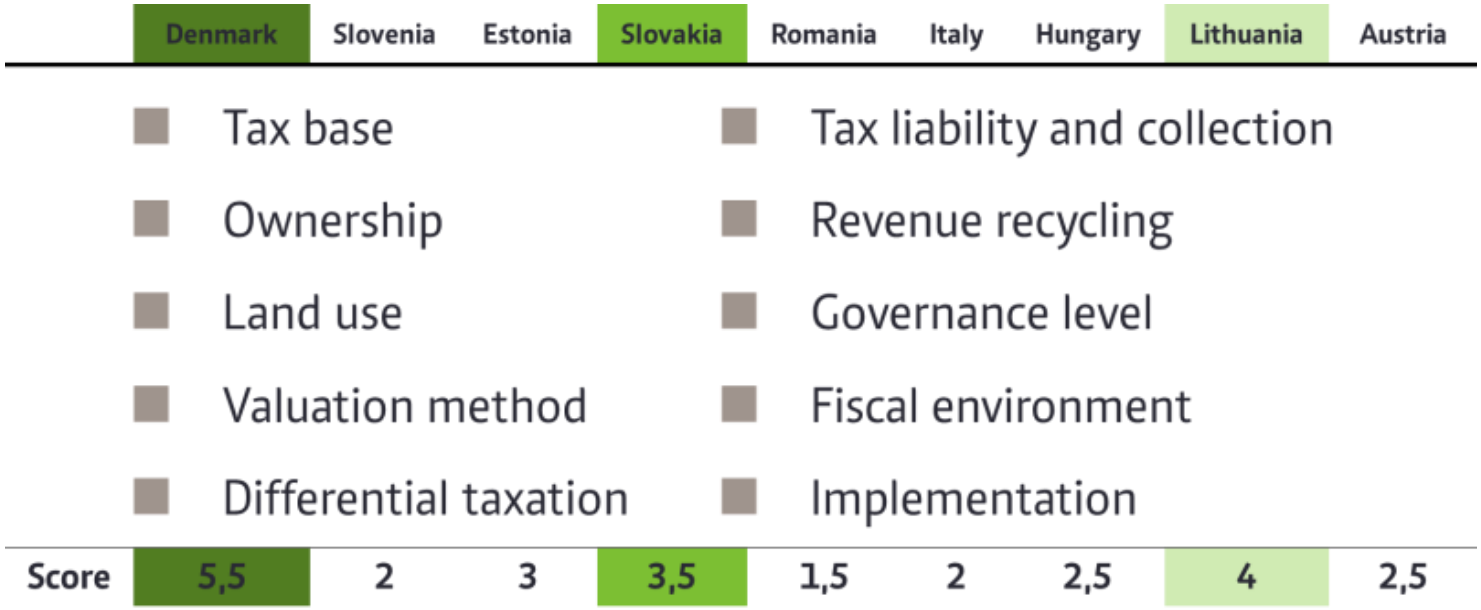


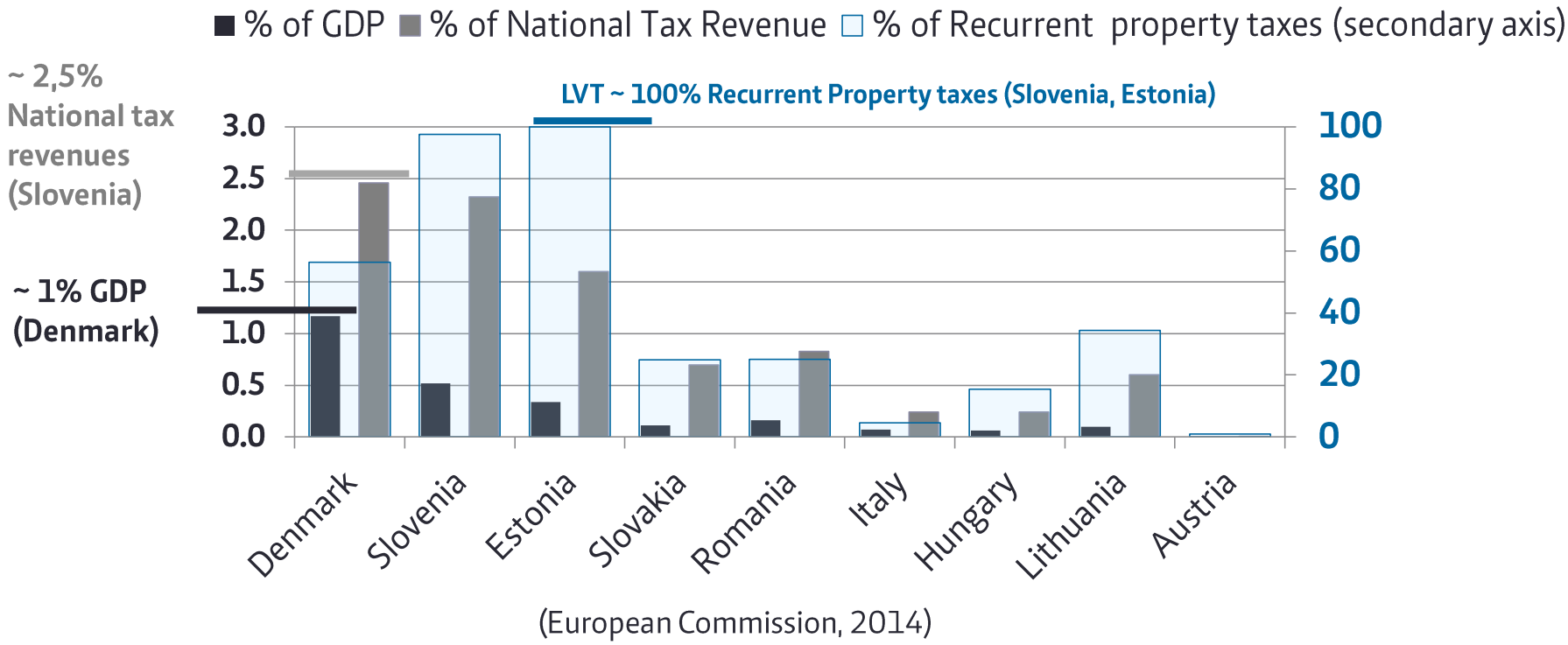
Malpractices all over Europe

All countries with LVT miss the maximal score of 10 by wide margin

Denmark: best practice.
Lithuania: Great efforts in updating cadastral values.
Slovenia: LVT: only recurrent tax in place. Recent abolishment by constitutional court.
Estonia: LVT: only recurrent tax in place. Tax base erosion (exemption of 0.15 ha).



Marginal contribution of LVT to the viability of municipal budgets



(European Commission, 2014)

Chapter 7. Wrap-up

Chapter 7
Sustainable Urban Planning:
Location Value Taxes

In theory, a shift towards LVT in the real estate taxation systems could stabilize local budgets, enhance fiscal equity and alleviate sprawl in the long run.

- In practice, few countries rely on LVT for raising local revenues.
- The few LVT practices in place contribute only marginally to local revenues and show considerable room for improvement.

PhD contribution

What is the **solution portfolio** for **long-term urban sustainability?**

- **Interdependencies** between different **sustainability policy agendas**
- **Strategies** better **achieve different objectives** simultaneously

How can **urban planning** and **fiscal policies** foster long-term urban sustainability?

- Stabilize local **budgets**, enhance fiscal **equity** and reduce **land consumption**

Which **governance practices** alleviate the complexity and degree of interdependence between different sustainability objectives?

- Through the facilitation of synergies
- Exploring the solution spectrum without compromising the legitimacy of the process

Research Questions

PhD contribution

Urban Planning assists in achieving different objectives simultaneously

Public health and risk reduction effectively address intrinsic factors
Urban planning efficiently address extrinsic factors, both in scale and scope

Recurrent taxes on location values together with **less permissive planning** potentially contribute to long-term urban sustainability.
Tax design: tax base, frequent assessment, and effects of additional distortive taxes

Multi-level governance assist in the deployment of sustainable strategies

Participatory processes uncover benefits:
- sustainability science (exploring the solution portfolio)
- policy implementation (facilitation of synergies)

Additional Info

PhD Publications

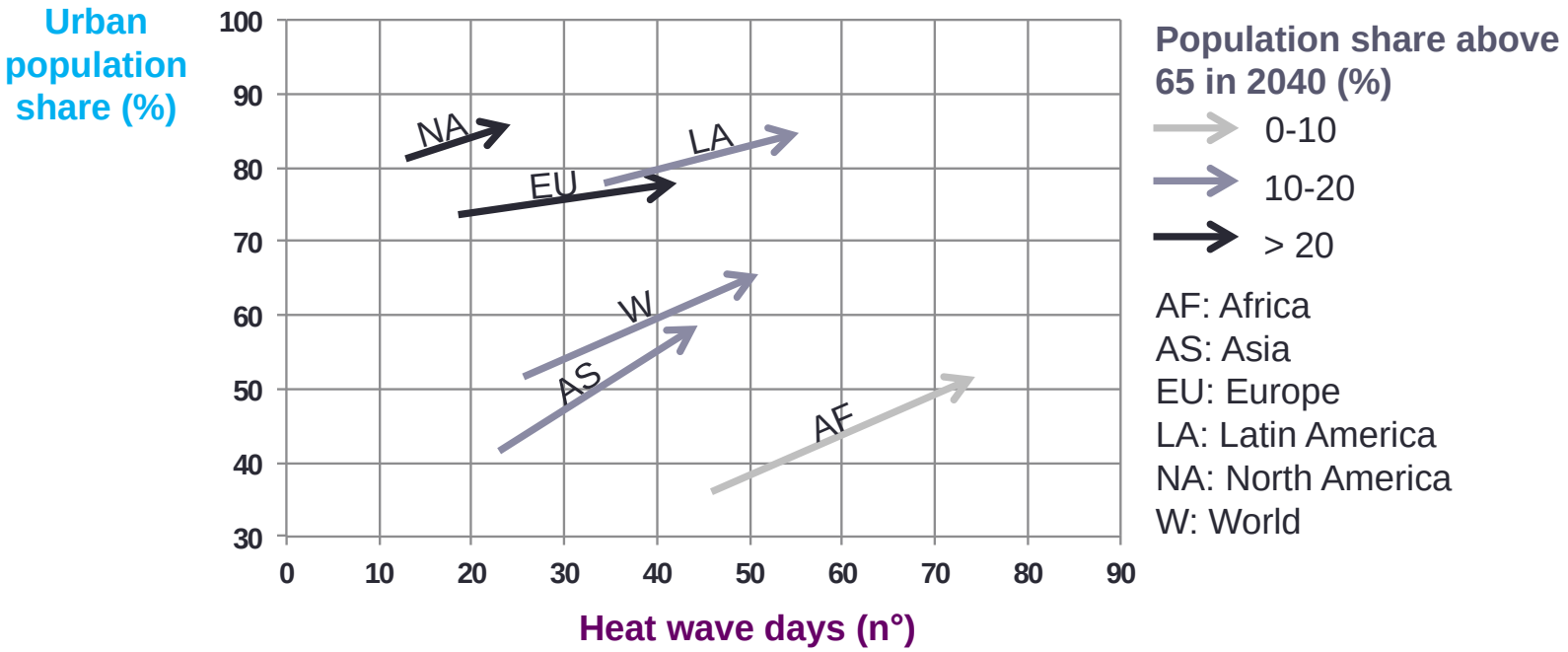
1. **Reckien**, Diana, Felix Creutzig, Blanca Fernandez, Shuaib Lwasa, Marcela Tovar-Restrepo, Darryn McEvoy, and David Sattherthwaite. **2016**. Climate Change, Equity and Sustainable Development Goals: An Urban Perspective. Environment and Urbanization (forthcoming).
2. **Creutzig**, Felix, Blanc Fernandez, Helmut Haberl, Radhika Khosia, Yacob Mulugetta, and Karen C. Seto. **2016**. Beyond technology: demand-side solutions to climate change mitigation. *Annu. Rev. Environ. Resour.* 41: 21.1–21.26.
3. **Fernandez Milan, Blanca, and Felix Creutzig. 2015.** Reducing urban heat wave risk in the 21st century. *Current Opinion of Environmental Sustainability* 14, 221-231.
4. **Fernandez Milan, Blanca. 2016**. Water security in an urbanized world: An equity perspective. Resubmitted as "Clean water and sanitation for all - Interactions with other Sustainable Development Goals" to Sustainable Cities and Society.
5. **Fernandez Milan, Blanca, and Felix Creutzig. 2016.** Municipal Policies Accelerated Urban Sprawl and Public Debts in Spain. *Land Use Policy* 54: 103–15.
6. **Fernandez Milan, Blanca,** David Kapfer, and Felix Creutzig. **2016.** A Systematic Framework of Location Value Taxes Reveals Dismal Policy Design in Most European Countries. *Land Use Policy* 51: 335–49.
7. **Fernandez Milan, Blanca. 2016.** How Participatory Planning Processes for Transit- Oriented Development Contribute to Social Sustainability. *Journal of Environmental Studies and Sciences* 6 (3): 520–524.
8. **Fernandez Milan, Blanca, and Felix Creutzig. 2016.** Participatory design in transit oriented development uncovers social benefits. Cities, under review.
9. **Mielke, Jahel,** Hanna Vermaßen, Saskia Ellenbeck, Blanca Fernandez, and Carlo Jaeger. **2016.** *Energy Research & Social Science.* 17 (2016) 71–81.
10. **Creutzig, Felix,** Jan Christoph Goldschmidt, Paul Lehmann, Eva Schmid, Felix von Blücher, Christian Breyer, Blanca Fernandez, Michael Jakob, Brigitte Knopf, Steffen Lohrey, Tiziana Susca, and Konstantin Wiegandt. **2014.** "Catching Two European Birds with One Renewable Stone: Mitigating Climate Change and Eurozone Crisis by an Energy Transition." *Renewable and Sustainable Energy Reviews* 38 (0): 1015–28.

Back-up slides

I
Aligning Policy Objectives through Urban Planning

↑ Heat-related morbidity and mortality
↑ Uneven distribution of risk

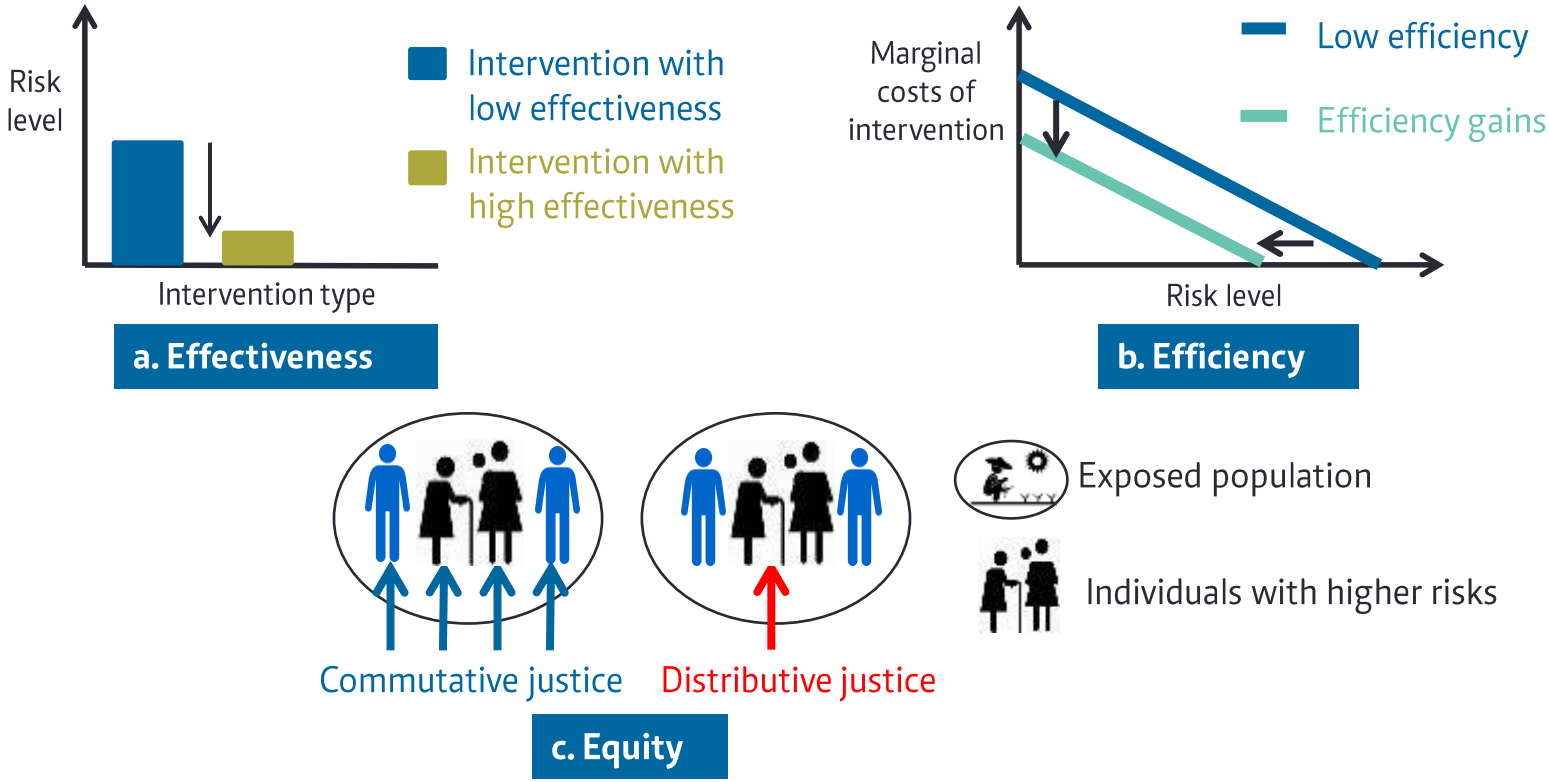
↑ **Heat waves severity** (**frequency**, intensity, duration)
↑ **Exposure** (**urban population**, n° of hours under the sun, occupation, ...)
↑ **Susceptibility** (**age**, medical status, gender, water availability, ...)



Evaluation of responses

1. Merge different strands of literature: Public health, Risk reduction and Urban planning

2. Evaluate response measures in addressing **total** and **distributed** risks



Urban Heat Risk, Health and Equity

		Vulnerability Factors
Intrinsic Factors	Age	Factors addressed with Heat Wave Warning Systems (HWHS)
	Gender	
	Medical Status	
Extrinsic Factors	**Person Specific**	
	Low socio-economic status	
	Low Education level	
	Working conditions: higher exposure, manual work, migrant farm workers.	
	Behaviors: loneliness, unawareness.	
	Location specific	
	Inexistence of open spaces, green and water bodies	
	Buildings: living under roof, upper floor, old structures.	
	Regions: tropical cities, not used to heat stress.	
	Urban Form: density, build-up and sealed surfaces, heave traffic, higher air pollution, industrial corridors.	

✕ Mitigation Strategy - Equity issues reported
UHI [Mitigation Urban Heat Island effect] Non Exclusionary Mitigation Effect

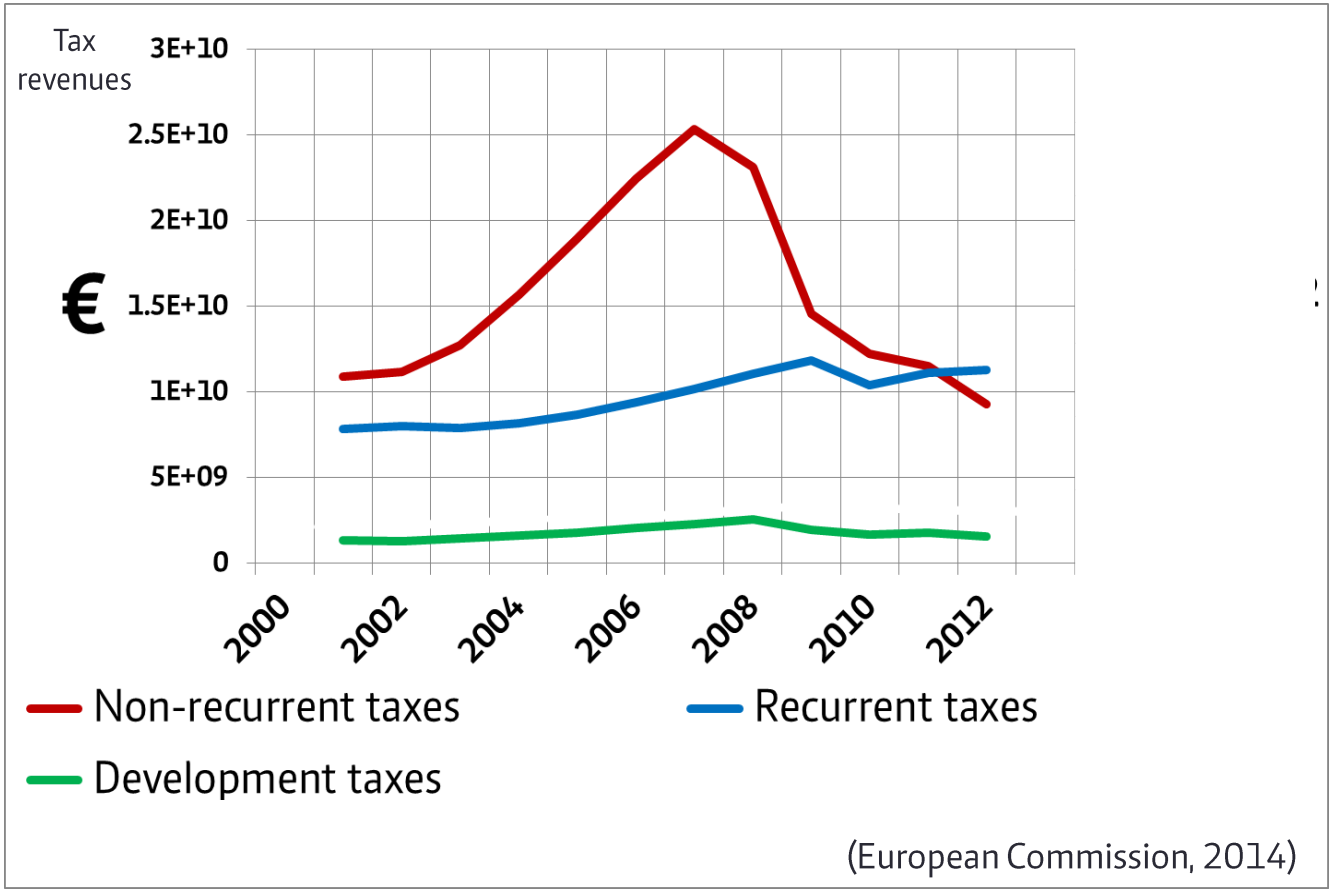
Urban Heat Risk, Health and Equity

	Mitigation Strategy		Outcome	
Short term Strategies	**HWHS**	Warnings, advice & Community support	✕	
		Hydration	✕	
		Health Sector: Prevention measures	✕	
		Drug Effect: warning, advice	✕	
		Use fans and cooling systems	✕	
		Access to cooling centers	✕	
		Traffic limit/ cut	✕	**UHI**
Long term Strategies	**Building adaptation**	Construction standards (i.e. LEED)	✕	**UHI**
		Building design (orientation, window, reduce roof top)		**UHI**
		Increase albedo (reflective / green)		**UHI**
	Land-use Management	Increase share green areas	✕	**UHI**
		Decrease share impervious surfaces		**UHI**
	Transport networks	Reduce motorized traffic: TOD		**UHI**
		Reduce motorized traffic: dismiss private	✕	**UHI**
	Urban Form	Reduce exposure times (connectivity, shadowing)		**UHI**
		Enhance building radiation balance (water bodies, buoyancy)		**UHI**
		Enhance air motion (ventilation corridors, non-blocked street intersections, visible open sky, avoid street canyon configuration)		**UHI**
		Decrease anthropogenic heat (i.e.: strategies away from electricity requirements, renewable energy)		**UHI**
	Governance	Holistic approach: mitigation strategies & public agencies		**UHI**

Back-up slides

II
Urban Planning induced distortions
The Spanish case

Property taxes: non-recurrent, recurrent & development taxes

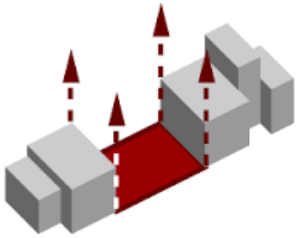


(European Commission, 2014)

non-recurrent

recurrent

development



Malfunctioning of property taxes and urban planning in Spain

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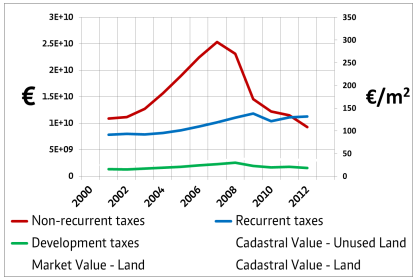
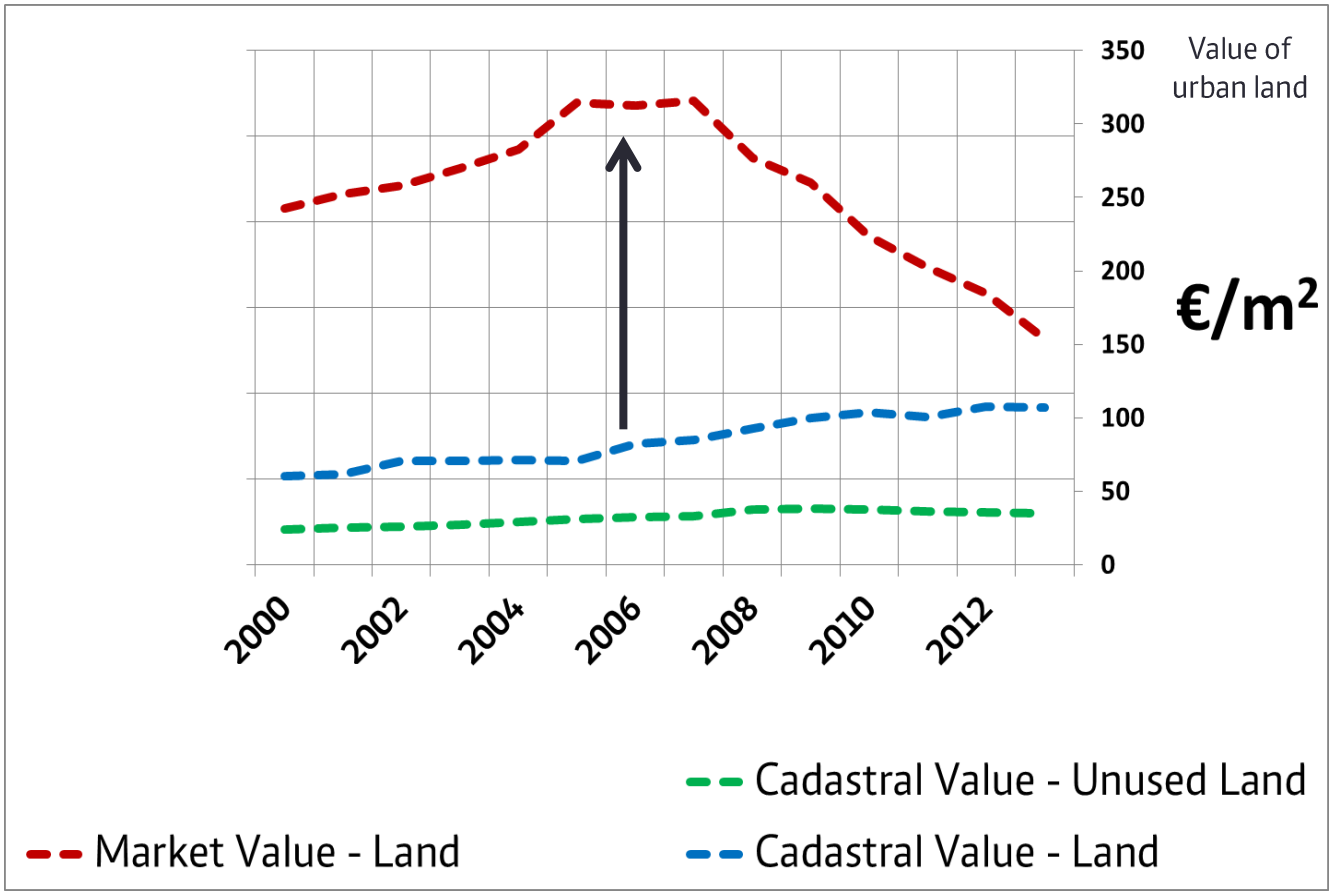
Policy instruments
Urban planning and property taxes



Gap between market values and recurrent tax bases



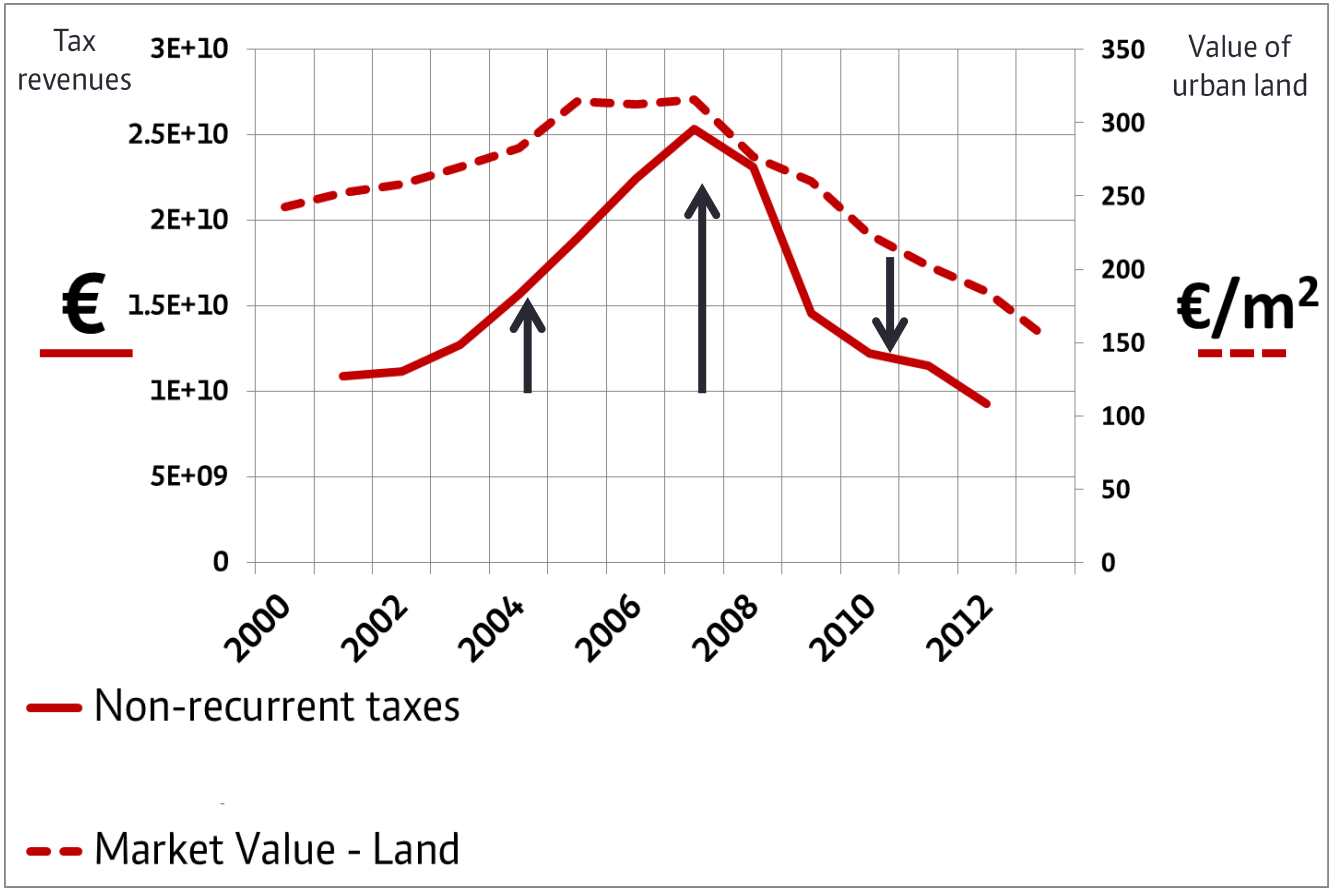
1

Market vs Cadastre

Cadastral values: represent only 35% of market values

→ **Outdated cadastral values**

Non-recurrent taxes: revenue instability



2

Non-recurrent taxes

→ **Updated cadastral values** (pre-sale cadastral value update)

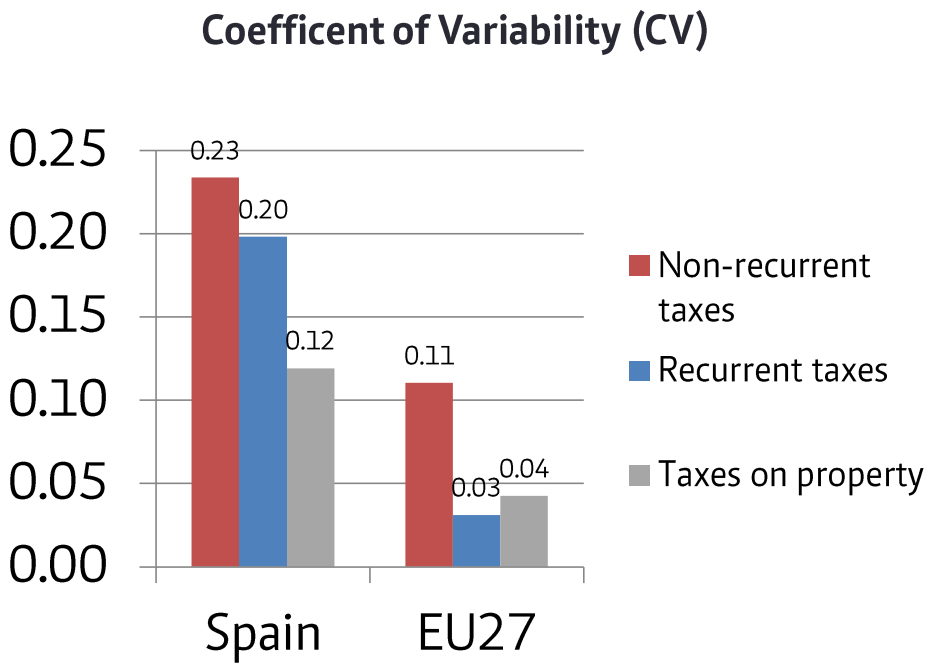
→ **Dependent on market activity**

Coefficient of Variability

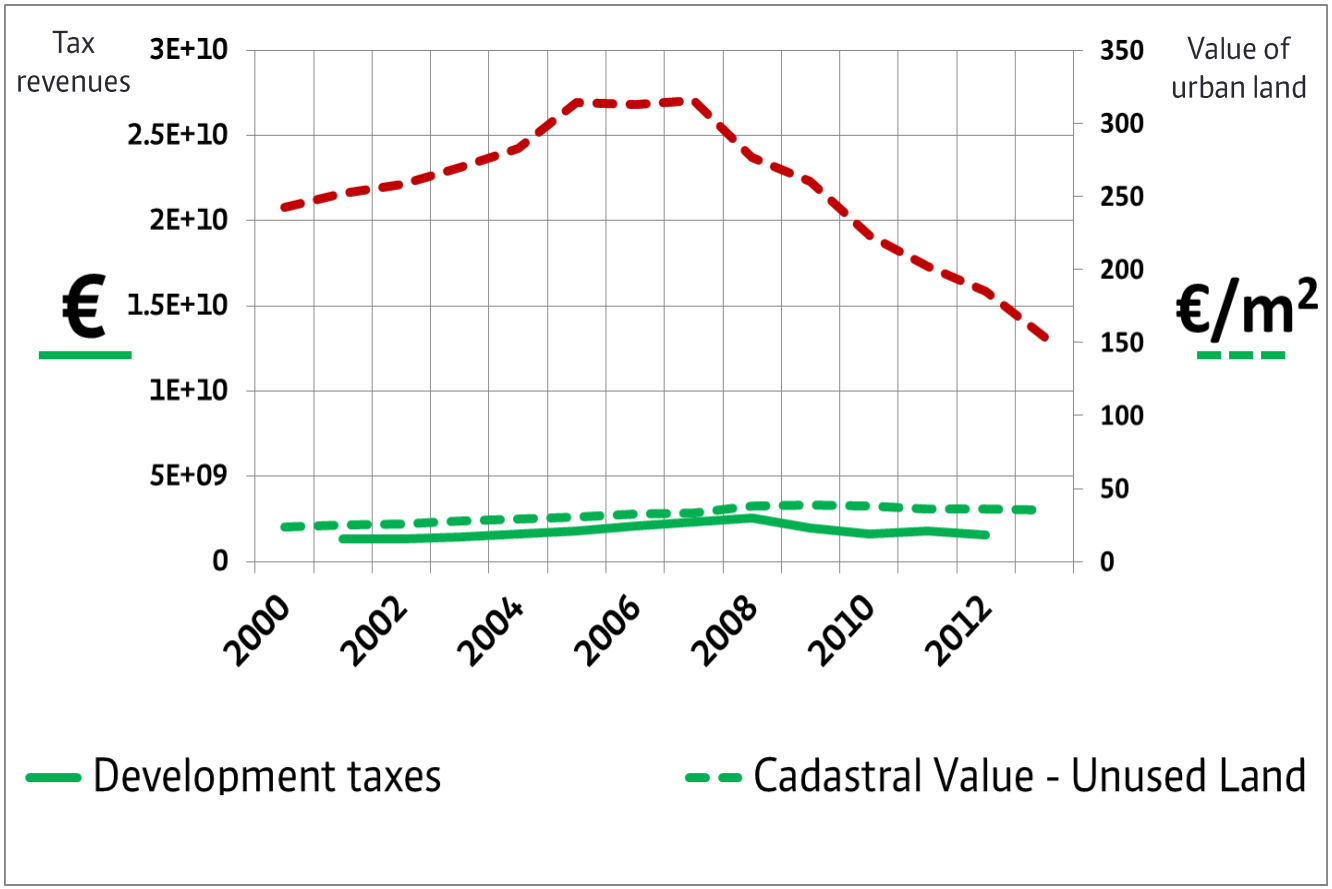
Spain: 0.23; EU27: 0.11.

Variability of Property Tax Contribution to Overall Tax Revenues

	% Σ Tax revenue	% GDP
Spain	**7.4** ($9{,}0_{2006}$ - 6.4_{2012})	**2.5** (3.3_{2006} – 2.0_{2012})
EU27	5.4	2.1



Development did not pay off



3

Developmen taxes

→ Decoupled from market dynamics

→ Rely on construction sector

Revenues decreased > 40% after 2008

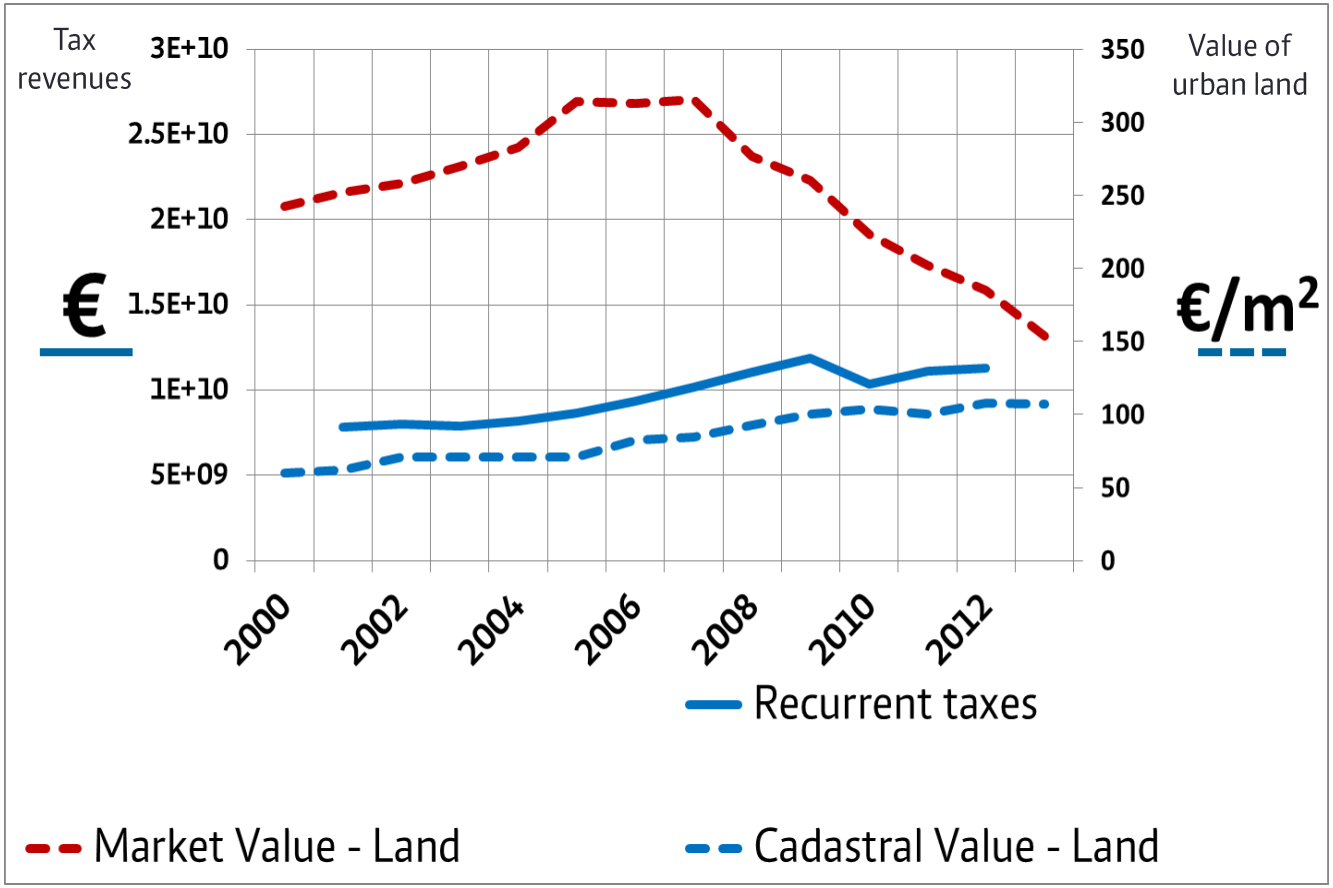
4

Land supply

→ Prices increased by ONLY 10% (no scarcity: ~consant supply: 57% urban land – vacant)

→ „Cheap land“

Recurrent taxes were not enough

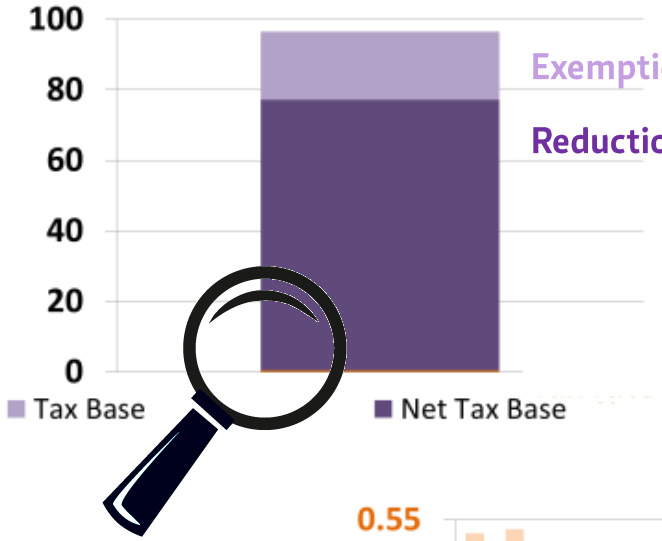


5

Recurrent taxes

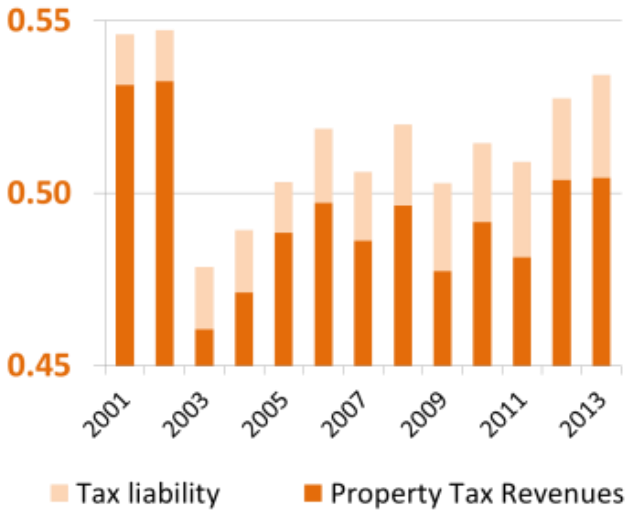
→ **Decoupled from market dynamics**

Recurrent taxes were not enough



Public, church

Weighted reductions following years after cadastral update



New Urban Development (50-90%)

5

Recurrent taxes

→ **Decoupled from market dynamics**

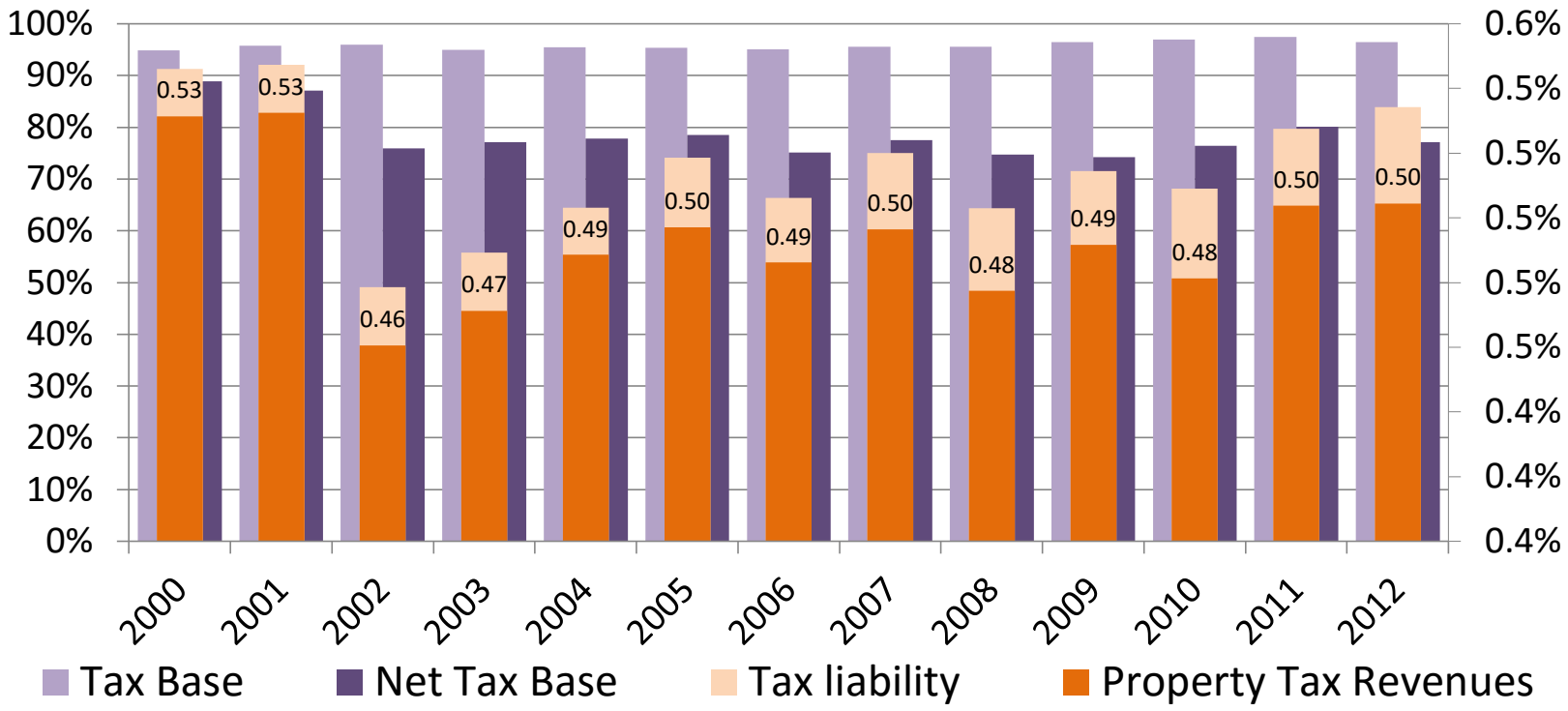
→ **Erosion of the tax base**

Exemptions, reductions, tax rate, deductions

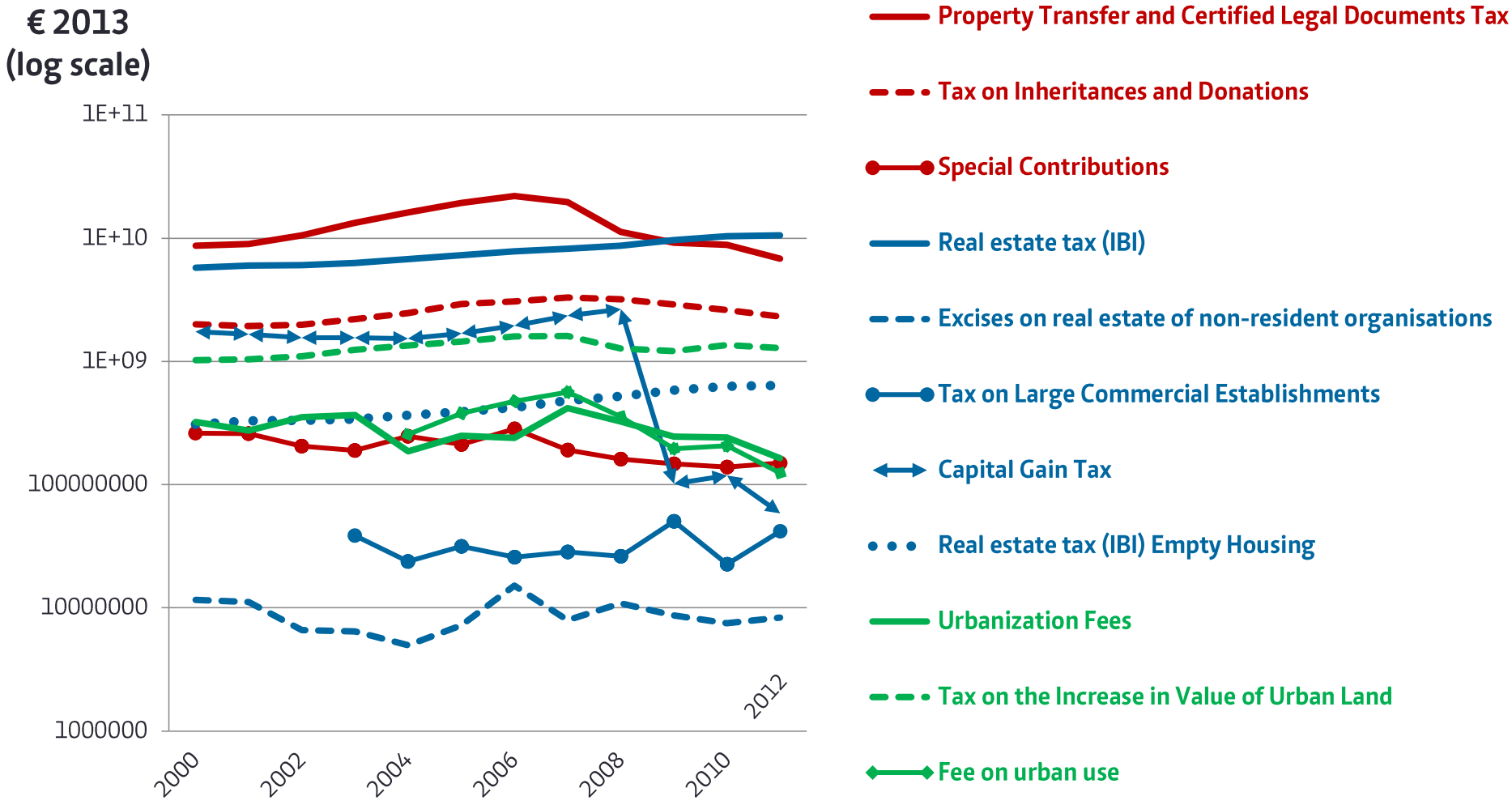
Spain – Tax base erosion

Cadastral value	Assessed value of properties
Tax base	**Cadastral Value of taxable properties – Exemptions** Public, church, communal (*), International (*), Education(*), Cultural patrimony, Railway infrastructures
Net tax base	**Tax Base – Reductions** - If cadastral values are updated, reductions for the next 9 years
Tax liability	Apply tax rate to net tax base
Net tax liability = Property tax revenues	**Tax liability – Deductions** - Ceuta & Melilla (-50%) - New Urban Development (50-90%) - Social housing (50%) - Other (*) **Tax liability + Surcharges** - Metro areas: +0.2% - Unoccupied residential buildings (up to +50%)

Share of total cadastral value "captured"



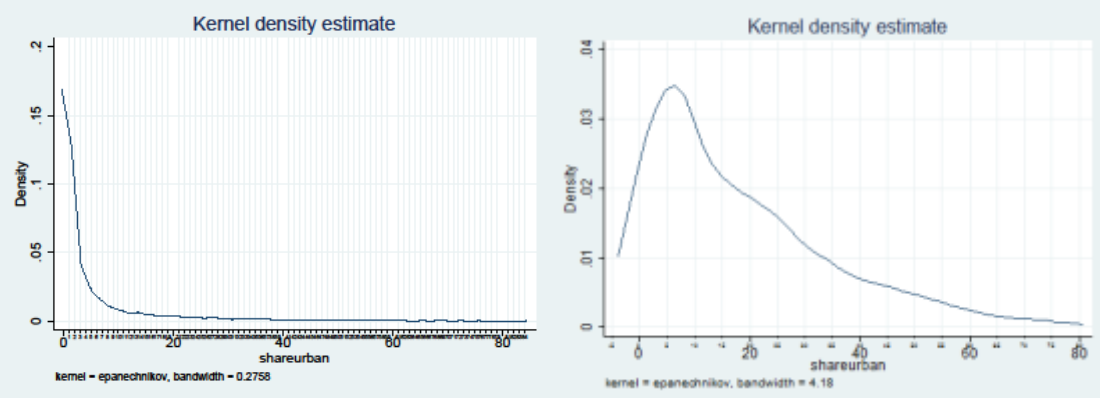
Spain: Disaggregated revenues from property taxes

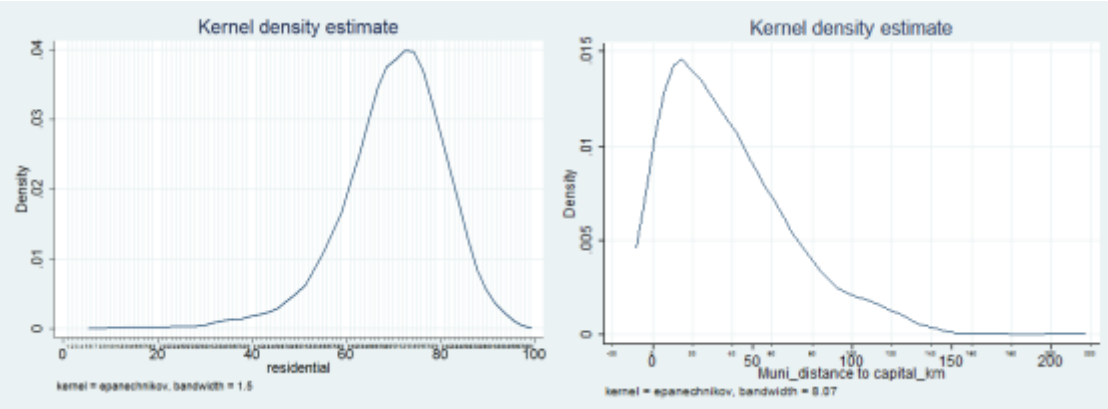


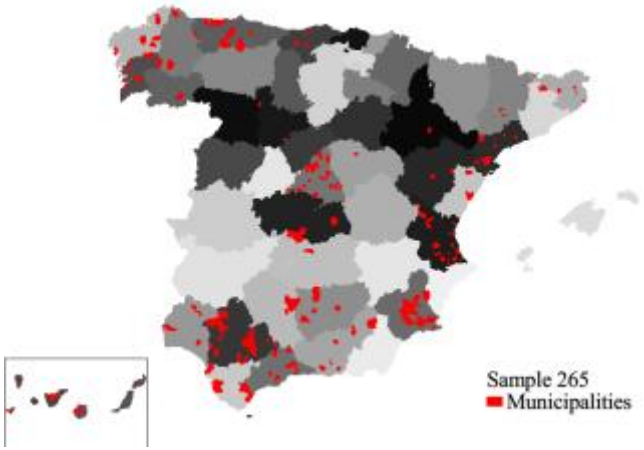
Spain – Sample selection (N=7585)

N_0			Excluded
8188	Data limitation	Basque Country and Navarra data unavailable	594
7594	Data limitation	Boundary change	9
7585	City definition	INE: 10,000 Our sample: 13000 (to raise the average urban share of the sample from 10 to 20% (see Fig. A.1).[1]	[1] A Kernel density curve serves us to estimate the optimal population limit to increase the urban share in the sample. Municipalities with population between 10000 and 13000 have relatively low urban share and would therefore not be representative if they were to be included.
C	Residential land share	Exclude municipalities that did not base their development on residential sprawl	The share of total cadastral value corresponding to residential land share. The total sample shows a residential cadastral value share between 55 and 85 (see Fig. A.1), thus we exclude those municipalities with less than 55% of residential cadastral value.
C	Municipal distance to capital	Focus on suburban sprawled development	Exclude metropolitan urban centres – province capital municipalities- and municipalities located within a ratio of 4.5 km (Average ratio of regional capitals: 4.5 km (INE, 2015))as well as those municipalities that are no longer in the metropolitan areas of influence -45 km- (Recent case studies looking at commuting patterns in Spain report community distances typically varying between 0 and 45 km in metro areas (Creutzig et al., 2012; Muñiz and Galindo, 2005; Romaní et al., 2003; Royuela and Vargas, 2009)).
FINAL SAMPLE **N = 265**		Statistical analysis represents the 54% of the total Spanish population and 63% of the province map Spanish population 44274277; sample population: 23838423. Spanish provinces: 52; sample provinces: 33.	

Spain – Sample selection (N=7585)







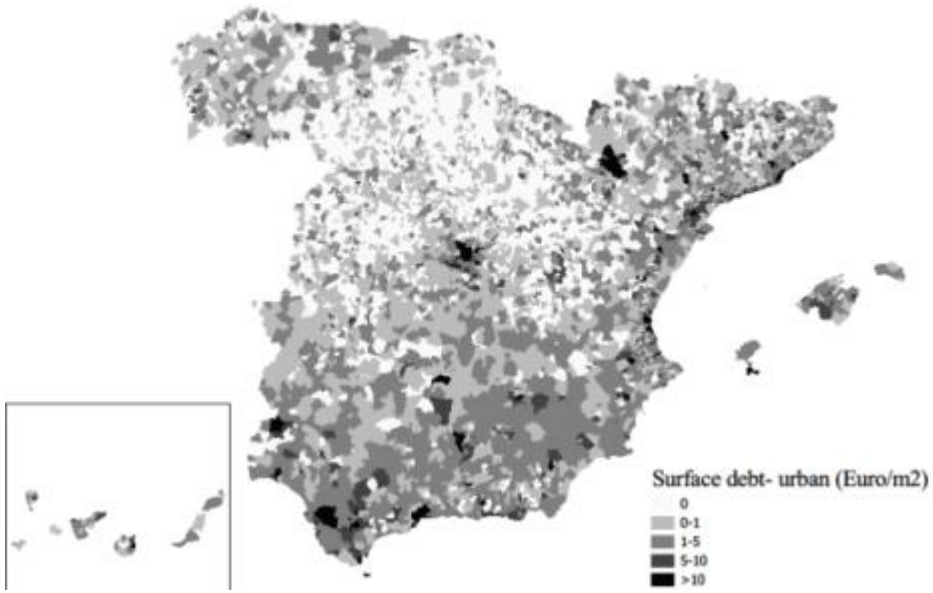
Spain: Variable definition and descriptive statistics (N = 265)

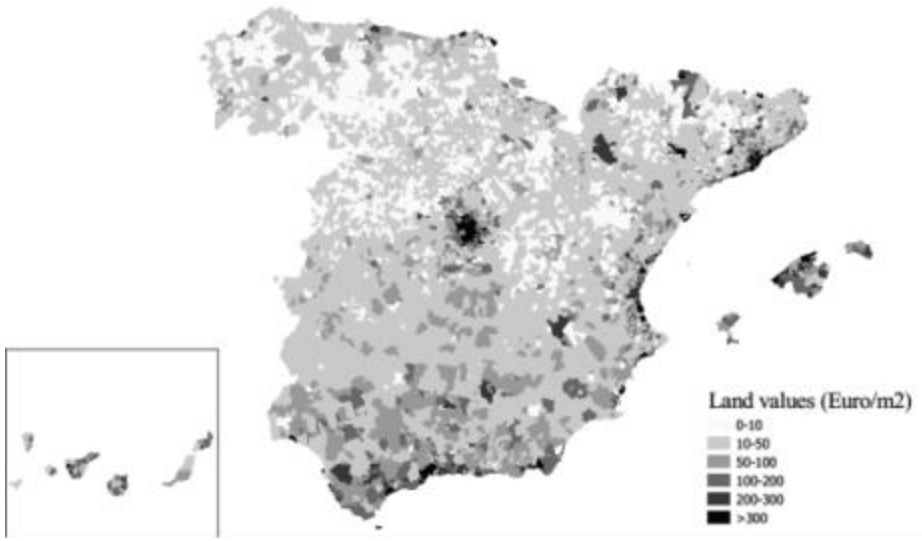
Indicator	Measure	Variable	Unit	Mean	Min	Max	S.D
Urban indictors	Sprawl	Δ Urban surface built per capita 2006-2013	m^2/pop	6.5	-164	179	33.8
	Debt	Surface debt: Municipal debt per surface	€/m2	3.7	0	33	4.4
	Location values	Location value	€/m^2	152	14	1086	151
		Residential property value (mean)	€	72,529	16,694	262,797	45138
Municipal characteristics		Population	nº	43,171	13,068	2,96,479	46955
		Share urban: Urban surface (% total surface)	%	22.2	0.5	76	17
		Urban Surface	ha	858	32	5546	842
		Distance to capital	km	22.9	4.6	45	11
		Province (dummy)	-	-	-	-	-
Local intervention	Tax induced distortions	Tax rate	%	0.6	0.2	1.2	0.2
		Exemptions	%	3.29	0	33.5	4.0
		Reductions	%	11.85	0	56.33	15.79
		Deductions	%	3.12	0	18.23	3.62
		Assessment year	year	2003	1986	2013	-
	Land supply	Share of urban surface not built	%	37.3	7.4	82.8	13

Spain - Regression models (N = 265)

		Data units	Dependent variable for the regression models analysed		
			Sprawl	Surface debt	Location value
			Δ Urban surface built per capita 2006-2013 (m2/pop)	Municipal debt per surface (€/m2)	€/m²
R^2 (adjusted)			**0.22**	**0.44**	**0.67**
Urban indictors	Debt	€/pop	-	-	-
	Surface debt	€/m2	0.82*	-	**9.18****
	Location value	€/m2	-	**0.01****	-
	Residential value	€	**-0.0003****	-	-
Municipal characteristics	Population	n°	**-0.0001***	**0.0005****	0.0006*
	Share urban	%	-	-	**1.59****
	Urban surface	ha	**0.02****	**-0.002****	**-0.03***
	Distance	km	**0.44****	-	-
	Province	(dummy)	-	yes	yes
Local intervention	Tax rate	%	**-20.37****	-	**-316.35****
	Exemptions	%	-	-	-
	Reductions	%	-	-	-
	Deductions	%	-	0.12*	-
	Assessment year	%	**1.17****	-	**7.33****
	Land supply	%	-	-	**-2.61****

Debt coincides spatially with location values





Spain - Regression model 1 - Sprawl (R^2: 0.22)

↑ Sprawl

↑ Surface debt

→ Public infrastructure investment for urbanization has been cost-free for developers (development taxes do not work, or not enough)

→ Municipalities learn to live on transfers, rezoning from rural/urban exacerbating housing bubble (results substantiated by Hortas-Rico, 2014)

↓ Residential value, population

↑ Urban surface, distance to metro areas

→ Sprawl occurs in cheap or subsidised land (Urban economics: (Brueckner and Fansler, 1983, Mieszkowski and Mills, 1993).

↓ Tax rates

→ Lower rates incentivise development (Anderson 1986, Groves 2009)

↑ Assessment year

→ Land for development is reassessed before and after development.

↑ **Land supply** (only significant correlation, but not in model)

→ Variable definition issues: development occurred already in the previous years and land reclassification for urban development is no longer occurring.

		Data units	Sprawl
R^2 (adjusted)			0.22
Urban indictors	Debt	€/pop	-
	Surface debt	€/m2	0.82*
	Location value	€/m2	-
	Residential value	€	-0.0003**
Municipal characteristics	Population	nº	-0.0001*
	Share urban	%	-
	Urban surface	ha	0.02**
	Distance	km	0.44**
	Province	(dum)	-
Local intervention	Tax rate	%	-20.37**
	Exemptions	%	-
	Reductions	%	-
	Deductions	%	-
	Assessment year	%	1.17**
	Land supply	%	-

Spain - Regression model 2 - Debt (R^2: 0.44)

↑ Surface debt

↑ Location values

→ Higher location values produce higher debt when they are not captured by taxes. Public surface debt is privately capitalized by location values.

↑ Population

↓ Urban surface

→ More population and the lesser the urban surface, the higher the surface debt. In areas with higher population density, the higher construction volume per surface leads to higher debts.

↑ Deductions

→ New development benefits from deductions that go from 50 up to 90% of the tax bill.

		Data units	Surface debt
R^2 (adjusted)			0.44
Urban indictors	Debt	€/pop	-
	Surface debt	€/m2	-
	Location value	€/m2	0.01**
	Residential value	€	-
Municipal characteristics	Population	nº	0.0005**
	Share urban	%	-
	Urban surface	ha	-0.002**
	Distance	km	-
	Province	(dum)	yes
Local intervention	Tax rate	%	-
	Exemptions	%	-
	Reductions	%	-
	Deductions	%	0.12*
	Assessment year	%	-
	Land supply	%	-

Spain - Regression model 3 - Location value (R^2: 0.67)

↑ Location values

↑ Surface debt

→ Higher surface debt produces higher location values as public investment increases location values

↑ Population, share urban

↓ Urban surface

→ Alonso 1964, Mills 1967, Muth 1968 (Urban economics)

↓ Tax rate

→ Lower tax rates lead to higher location values. (coherent with the insights from land taxation theory: higher taxation stabilize location values) (Cocconcelli and Medda, 2013; Dye and England, 2009; Tideman, 1982).

↑ Year of assessment

→ Importance of year of assessment to close gap between market & cadastre.

↓ Land supply

→ The lesser the land supply, the higher the land scarcity and thus the higher the market competitiveness leading to higher location values.

		Data units	Location value
R^2 (adjusted)			0.67
Urban indictors	Debt	€/pop	-
	Surface debt	€/m2	9.18**
	Location value	€/m2	-
	Residential value	€	-
Municipal characteristics	Population	nº	0.0006*
	Share urban	%	1.59**
	Urban surface	ha	-0.03*
	Distance	km	-
	Province	(dum)	yes
Local intervention	Tax rate	%	-316.35**
	Exemptions	%	-
	Reductions	%	-
	Deductions	%	-
	Assessment year	%	7.33**
	Land supply	%	-2.61**

Spain - Regression models – Results

↑ Sprawl

↑ Surface debt

→ Public infrastructure investment for urbanization has been cost-free for developers (development taxes do not work, or not enough)

→ Municipalities learn to live on transfers, rezoning from rural/urban exacerbating housing bubble (substantiated by Hortas-Rico, 2014).

↓ Residential value, population; ↑ Urban surface, distance to metro areas

→ Sprawl occurs in cheap or subsidised land (Urban economics: (Brueckner and Fansler, 1983, Mieszkowski and Mills, 1993).

↓ Tax rates

→ Lower rates incentivise development (Anderson 1986, Groves 2009)

↑ Surface debt

↑ Location values

→ Higher location values produce higher debt when they are not captured by taxes. Public surface debt is privately capitalized by location values.

↑ Population; ↓ Urban surface

→ Areas with higher population density, higher construction volume pre surface and higher debts.

↑ Deductions

→ New development benefits from deductions that go from 50 up to 90% of the tax bill..

↑ Location values

↑ Surface debt

→ Higher surface debt produces higher location values as public investment increases location values

↑ Population, share urban

↓ Urban surface

→ Higher population and urbanized surface lead to higher location values Urban economics (Alonso 1964, Mills 1967, Muth 1968)

↓ Tax rate

→ Lower tax rates lead to higher location values (coherent with insights from land taxation theory: higher taxation stabilize location values) (Cocconcelli and Medda, 2013; Dye and England, 2009; Tideman, 1982).

↑ Year of assessment

→ Importance of year of assessment to close gap between market & cadastre.

↓ Land supply

→ The lesser the land supply, the higher the land scarcity and thus the higher the market competitiveness leading to higher location values.

Tax distortions and urban planning accelerated sprawl and debts

Urban Economics &land taxation theory

- → Sprawl occurred in cheap or subsidised land (Brueckner and Fansler, 1983, Mieszkowski and Mills, 1993).
- → Higher population and proportion of urbanized surface lead to higher location values (Alonso 1964, Mills 1967, Muth 1968).
- → Lower tax rates incentivised development (Anderson 1986, Groves 2009).
- → The lesser the land supply, the higher the land scarcity and thus the higher the market competitiveness leading to higher location values.
- → Lower tax rates lead to higher location values (coherent with insights from land taxation theory: higher taxation stabilize location values) (Cocconcelli and Medda, 2013; Dye and England, 2009; Tideman, 1982).

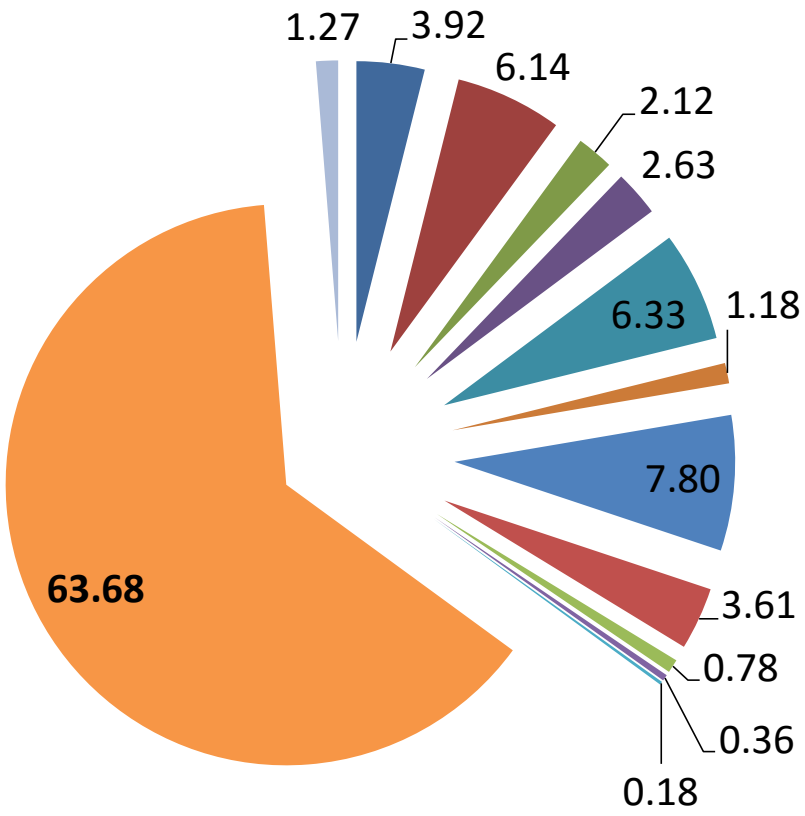
The nexus between sprawl, debts and location values

- → **Sprawl** was driven by vast public investments, and distorted urban planning and fiscal policies, **getting heavily into debt**.
- → Public infrastructure investment for urbanization and land subsidies have been "cost-free" for developers (development taxes do not work, or not enough).
  - → Deductions fostered higher debts (new development benefits from deductions that go from 50 up to 90% of the tax bill).
- → Higher surface debt produces higher location values → public investment increases location values.
- → Higher location values produce higher debt → location values only partially captured by taxes. Public surface debt is privately capitalized by location values.
- → Municipalities learn to live on transfers, rezoning from rural/urban exacerbating housing bubble (substantiated by Hortas-Rico, 2014).
- → Importance of year of assessment to close gap between market & cadastre (higher location values in places where assessment were more recent).

Spain – Correlation coefficients

	Sprawl	Surface debt	Land value	Residential	Population	Share urban	Urban surface	Distance to capital	Tax rate	Exemptions	Reductions	Deductions	Assessment year
Surface debt	0.0												
Land value	-0.1*	**0.5****											
Residential mean	**-0.3****	0.0	**0.5****										
Population	0.1	**0.4****	**0.3****	0.1									
Share urban	-0.1*	**0.2****	**0.4****	**0.3****	**0.3****								
Urban surface	**0.2****	0.0	0.0	**0.2****	**0.7****	0.1							
Distance to capital	**0.2****	-0.1	**-0.2****	0.01	-0.1	**-0.4****	0.0						
Tax rate	0.0	**0.2****	**-0.2****	**-0.4****	-0.1	0.0	-0.2*	0.1					
Exemptions	0.0	0.0	0.1	0.2*	0.0	0.1*	0.0	0.0	-0.1				
Reductions	0.0	0.1	**0.3****	**0.5****	0.1	0.1	0.1	0.0	-0.1	0.0			
Deductions	0.0	0.2*	0.0	0.0	0.2*	0.1	0.1*	0.0	0.0	0.0	0.0		
Assessment year	0.0	0.1	**0.4****	**0.6****	0.1	0.2*	0.1	-0.1	**-0.2****	0.2*	**0.8****	-0.1	
Land supply	**0.2****	**-0.3****	**-0.3****	0.0	0.0	-0.1	**0.3****	0.1*	**-0.2****	0.1	0.0	0.0	0.1

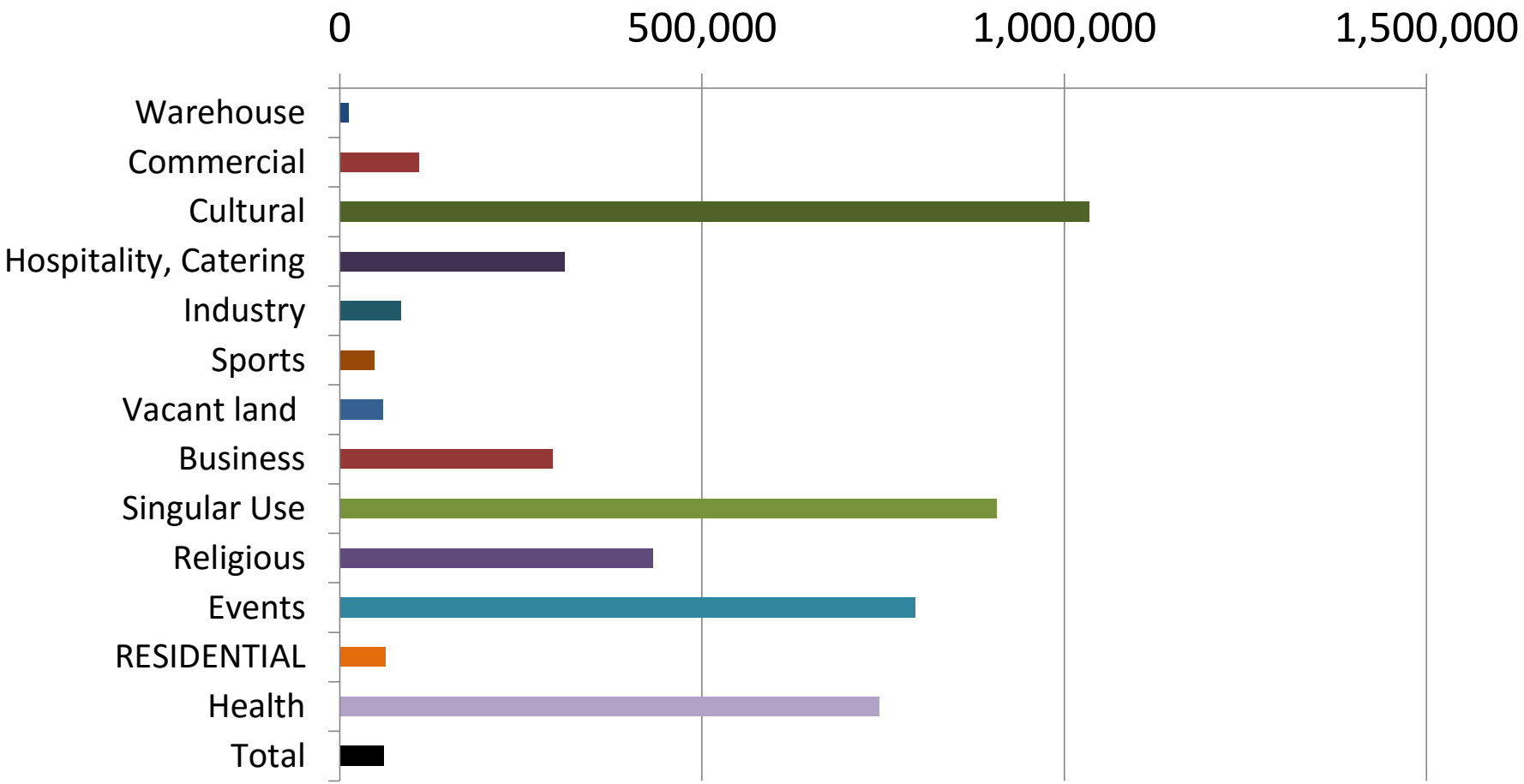
Spain – Urban land uses and contribution to cadastral values (%)

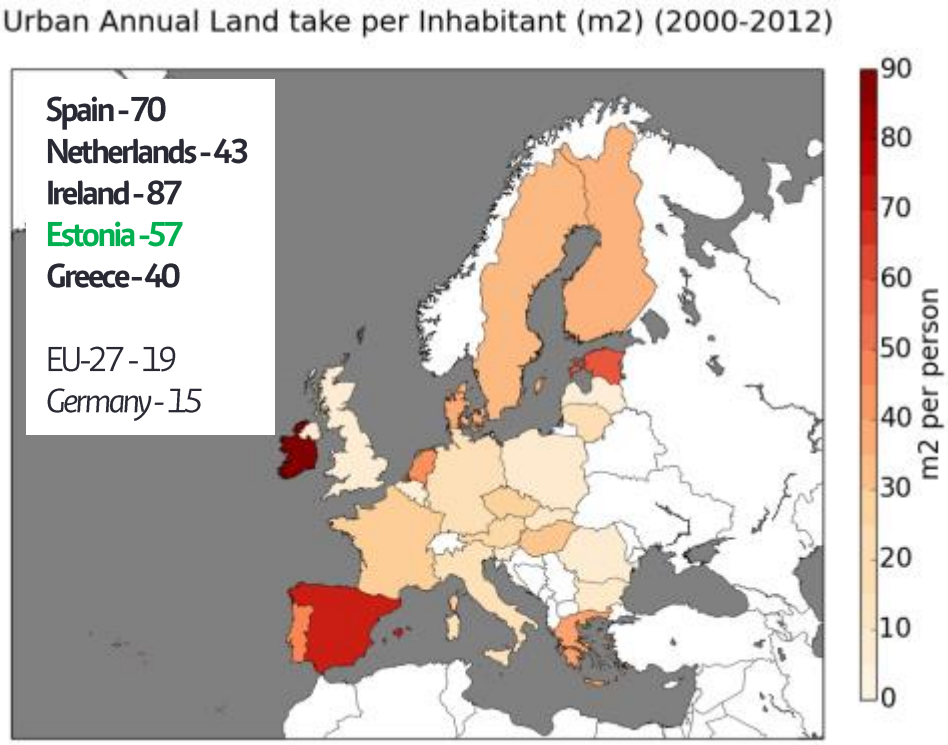


- Warehouse
- Commercial
- Cultural
- Hospitality, Catering
- Industry
- Sports
- Vacant land
- Business
- Singular Use
- Religious
- Events
- **RESIDENTIAL**
- Health

	N° properties
Warehouse	7,907,817
Commercial	1,292,664
Cultural	471
Hospitality, Catering	195,287
Industry	1,720,250
Sports	56,441
Vacant land	3,003,742
Business	282,134
Singular Use	19,708
Religious	41,339
Events	5,285
RESIDENTIAL	23,010,869
Health	3,918
Total	37,622,544

Spain – Urban land uses and mean values (2013 €)





Housing, Services, Recreation (33%), Construction (62%)

Transport Development (6%)

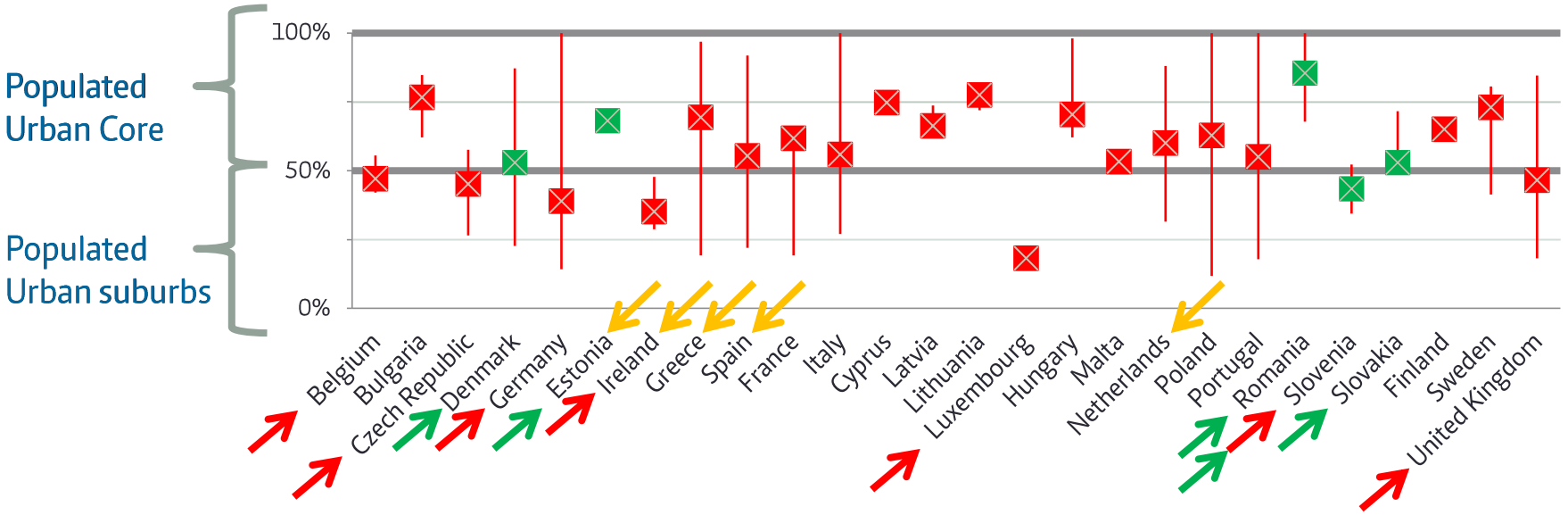
Urban Land Policies

Europe´s Urban Sprawl

a. **Lifestyle-driven** (demand side): Northern and Western Europe
b. **Infrastructure-related** (supply side): Southern Europe
c. **Regulation-related**: post socialist Central-East Europe
d. **Declining urban areas**: City specific (i.e.: Leipzig and Liverpool)
e. **Development of second homes** (Sweden, Austria, Spain)

Core City Population as percentage of LUZ (Large Urban Zone)

Country statistics



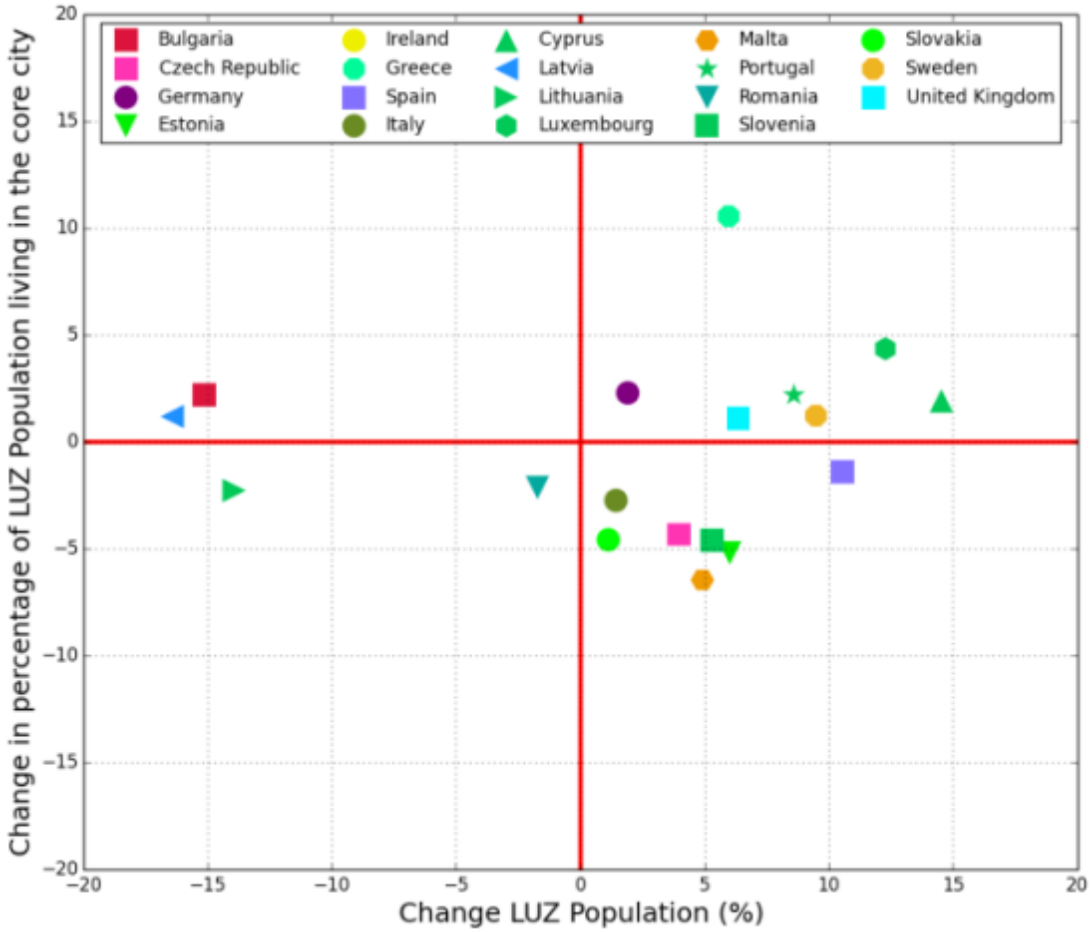
R6: Today´s urban settlements in Europe show sprawled and non-sprawled forms

R7: Urban structures of those countries with LVT have no significant difference with those with no LVT countries

Sample: Size: 531, Avg. 58.49%

Urban Decline with Containment

Urban Growth with Containment



Urban Decline with Sprawl

Urban Growth with Sprawl

R9: No visible relation between Urban Dynamic and the existence / not existence of LVT
Infrastructure related sprawl shows higher rates

Additional Info – Urban Areas in Europe

Urban growth vis-à-vis urban sprawl	
Urban growth with Containment	Urban growth with Sprawl
Aalborg, Aarhus, Copenhagen, Larissa, Nicosia, Stockholm	Amsterdam, Arnhem, Athens, Banska Bystrica, Athens, Berlin, Brussels, Dublin, Lisbon, Ljubljana, Luxembourg, Vienna, Warsaw,
Urban decline with Containment	**Urban decline with Sprawl**
Campobasso, Kalamata	Birmingham, Bratislava, Budapest, Leipzig, Liverpool, Prague, Rome

Property tax revenues in 2011 on average accounted only for 2% of national GDPs, the same as in 2000. The share of total taxation has also remained stable around 5%.

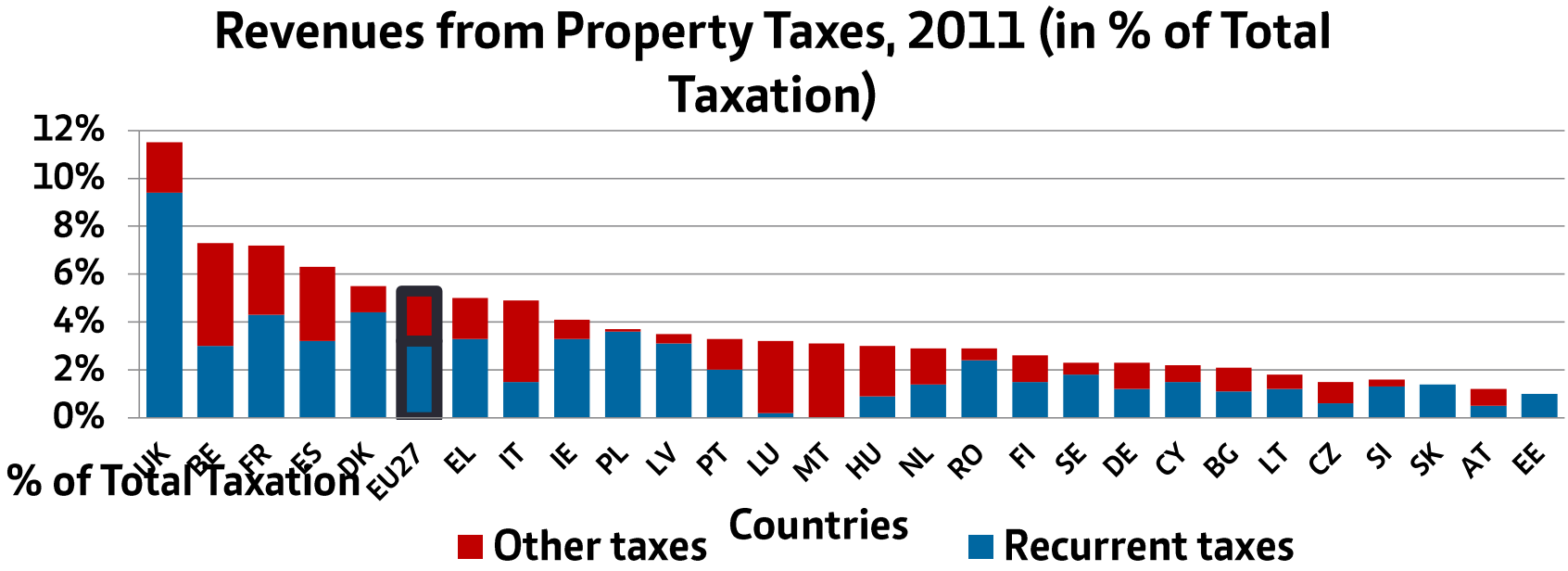
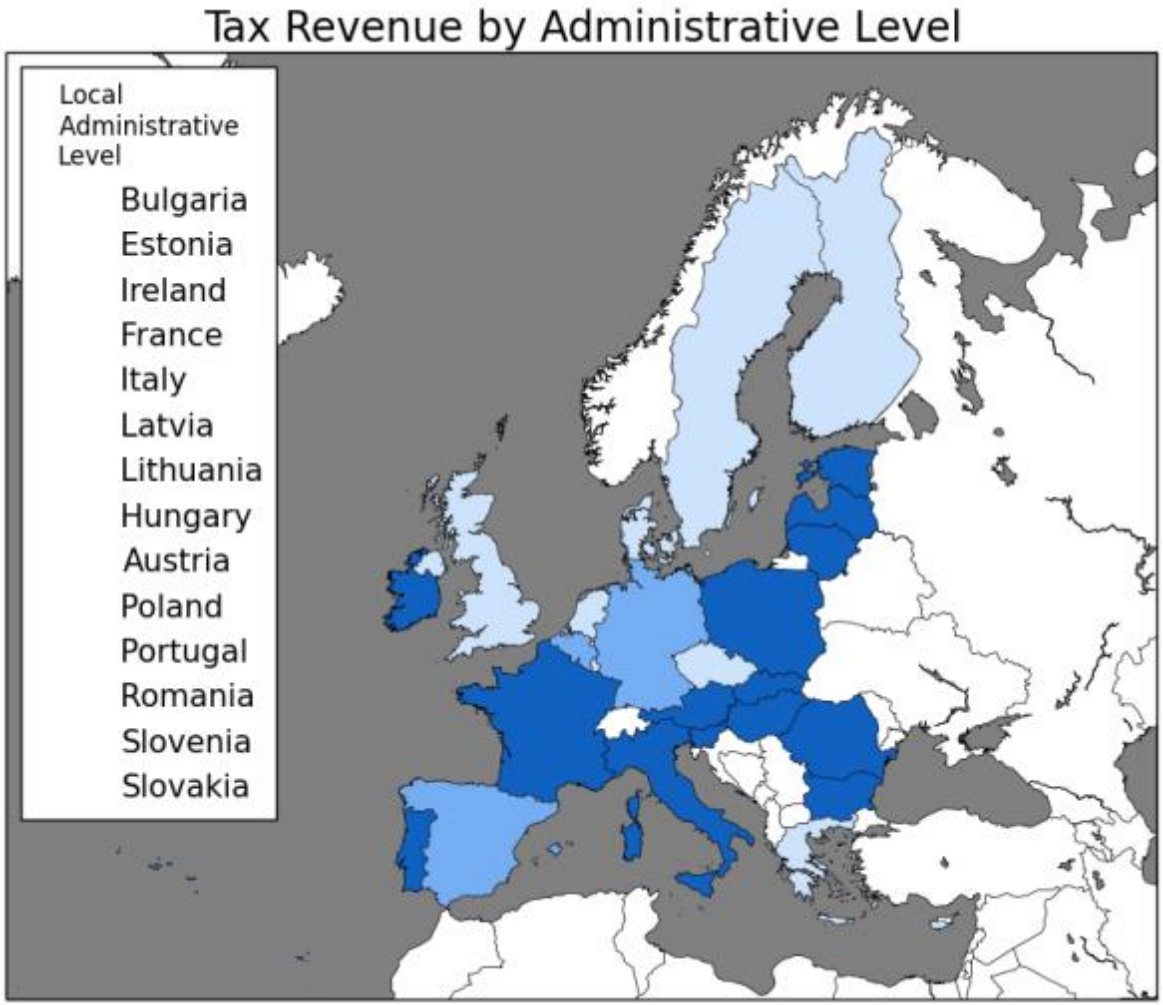


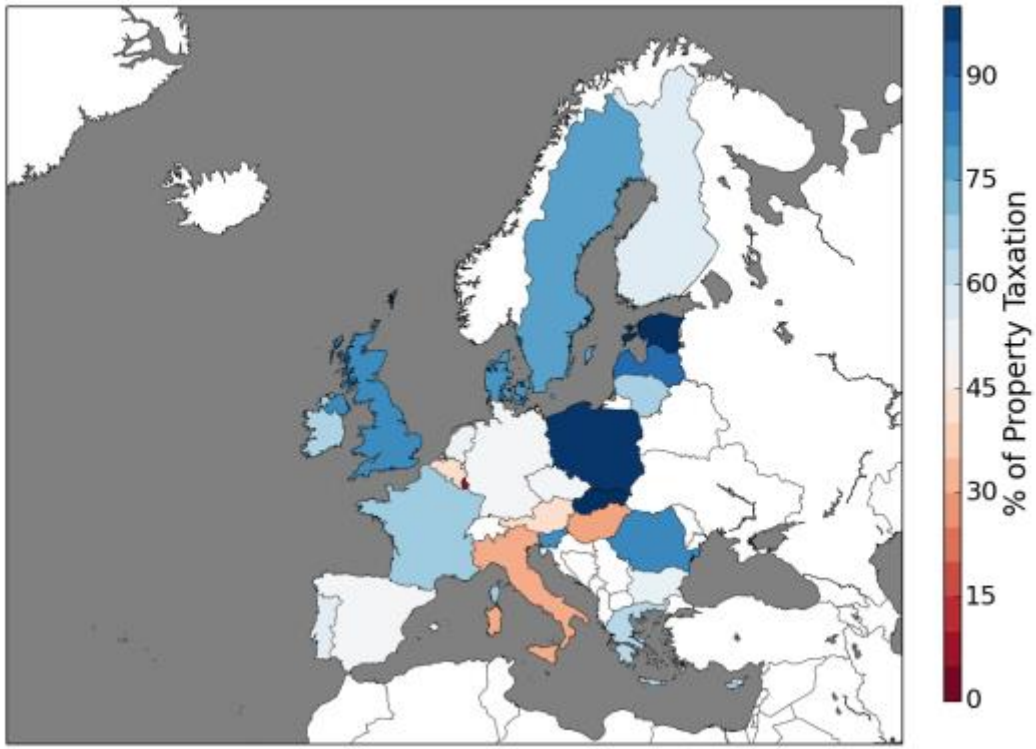
Fig 5. Data Source: European Commission 2014

R1: Current accounting systems do not look at specifics of land-based regimes, they are embedded in larger tax designs (i.e.: OECD, Eurostat, ...)

Major benefit
Local
Regional
Central



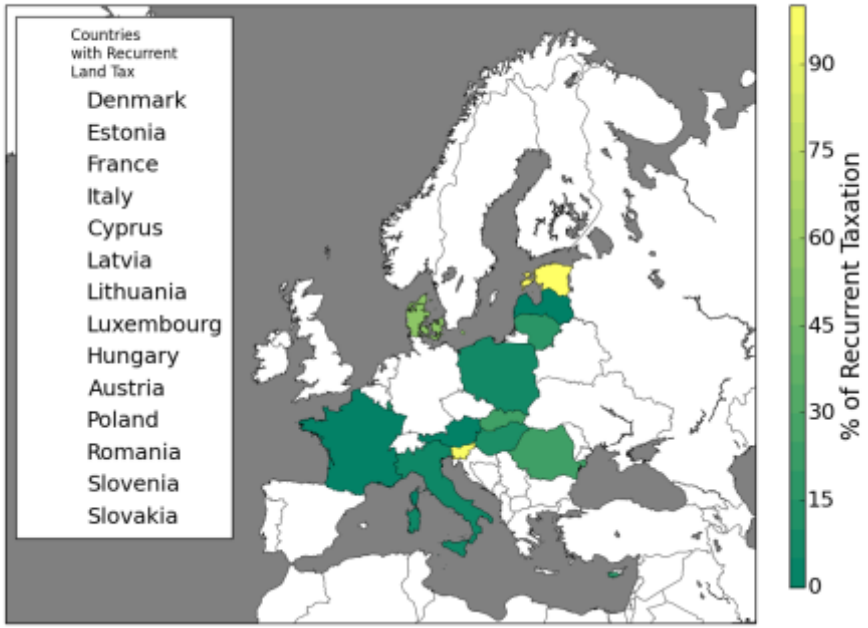
Recurrent Tax Revenues as a Percentage of Total Property Taxation (2011)



Estonia, Poland and Slovakia (dark blue in the map), with property tax systems based mostly on recurrent taxation, give all revenue to local authorities.

R2: Recurrent Taxation on average accounts for 60% of the revenues from Property Taxes
R3: Most Recurrent Tax revenues are locally distributed (70%)

Land based Tax Revenues as a Percentage of Recurrent Taxation (2011)



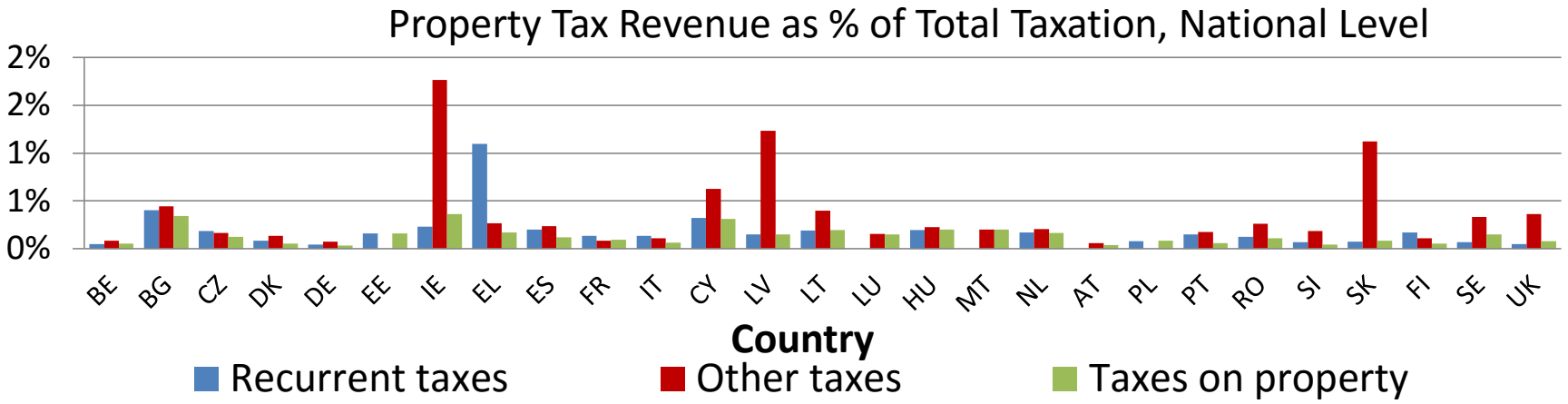
	% Recurrent Taxes	R	% Property Taxes	R	% Total Tax Revenues	R	% GDP	R
Estonia	100	1	100	1	1.56	3	0.32	3
Slovenia	97.54	2	79.24	2	2.13	2	0.47	2
Denmark	55.41	3	44.03	3	2.50	1	1.17	1
Slovakia	25.17	4	25.16	4	0.64	5	0.10	5
Romania	24.71	5	20.29	5	0.85	4	0.16	4
Lithuania	16.69	6	11.12	6	0.32	7	0.05	8
Cyprus	15.81	7	10.67	7	0.32	8	0.08	6
Hungary	11.29	8	3.37	9	0.15	9	0.04	9
Lux.	9.85	9	0.61	12	0.03	12	0.01	12
Poland	7.13	10	7.02	8	0.39	6	0.08	7
Italy	5.60	11	1.75	10	0.13	11	0.04	10
France	1.37	12	0.93	11	0.13	10	0.04	11
Austria	0.89	13	0.37	13	0.01	13	0.00	13

R5: Land-based taxes show less variability in their revenues compared to Building or RS based taxes (CV: 0.25 to CV:0.31 and CV: 0.49 respectively)

R6: However, as opposed to what theory suggests, recurrent land-based taxation plays a minor role in overall national public revenues (see table above).

In terms of percent contribution to GDP, **the variability of non recurrent taxes is higher than the one of recurrent** (CV:0.64 to CV:0.56). The same result holds for the contribution to the total tax revenue (CV: 0.11 to CV: 0.03).

Coefficient of variation (2000 – 2011)

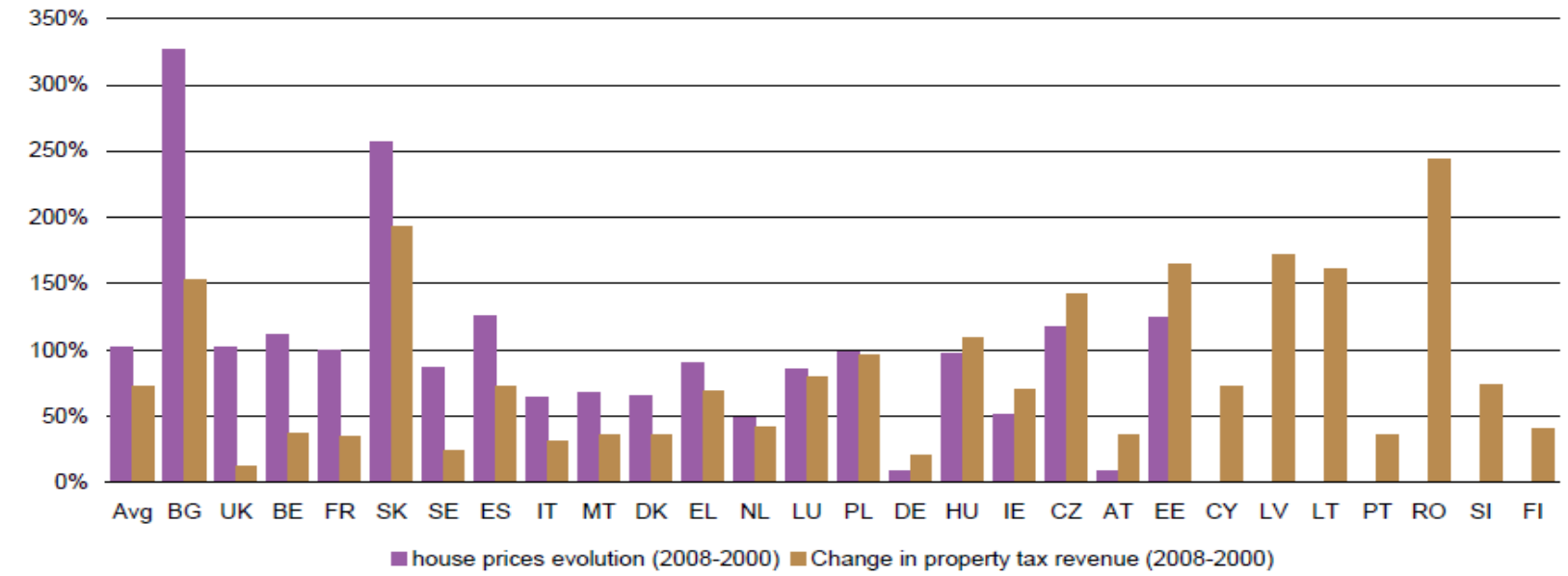


Looking at the **property tax revenues, recurrent taxes also show lower variability**. At the national level, the same result holds, with exception of Greece (EL).

R4: The variability of returns from recurrent taxes is lower than the one from other property taxes

Property tax regimes are unable to reflect housing dynamics, strongly related with local provision of public goods. As a result, we have an increasing gap between local revenues and investments.

Graph 2.1: Growth in house prices and revenue from recurrent immovable property taxes, 2000-2008



Note: Avg: The average only include those countries for which data on the house price evolution and on the change in property tax revenue are available
Source: Commission services

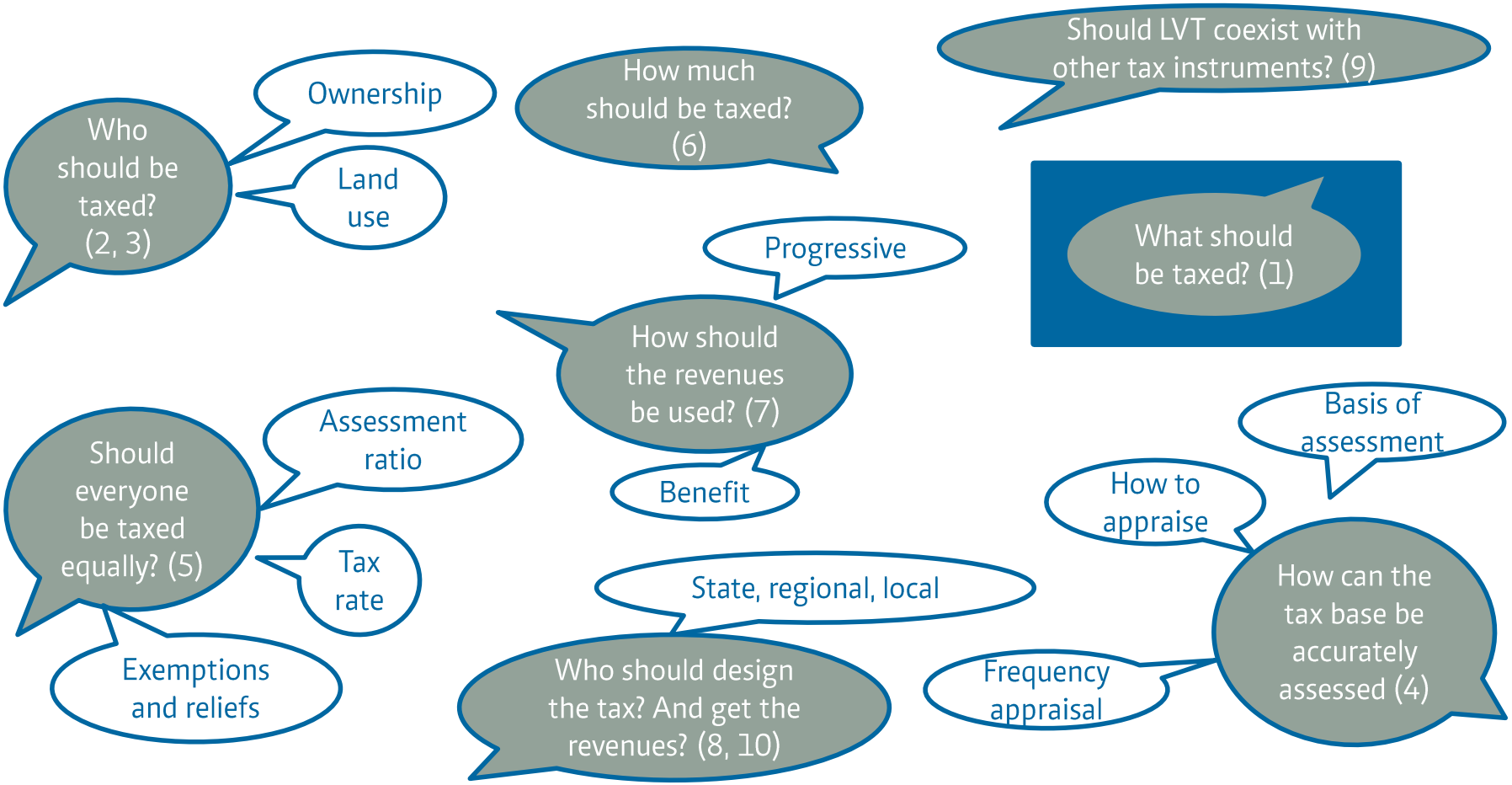
Additional Info – General Property Tax Classification

Taxes on property OECD (12)	ESA95: European System of Accounts (10)	EUROSTATS and EC Reports (2)
Recurrent taxes on immovable property		Recurrent taxes on immovable property
Households	Current taxes on capital	
Others	Taxes on land, buildings or other structures	
Recurrent net wealth taxes		Other property taxes
Individual	Current taxes on capital	
Corporations	Current taxes on capital	
Estate, inheritance and gift taxes		
Estate and inheritance taxes	Taxes on capital transfers	
Gift taxes	Taxes on capital transfers	
Taxes on financial and capital transactions	Stamps – taxes on financial and capital transactions	
Other non-recurrent taxes on property	Capital levies	
Other recurrent taxes on property	Current taxes on capital	

Back-up slides

III
Sustainable Urban Planning: Location Value Taxes

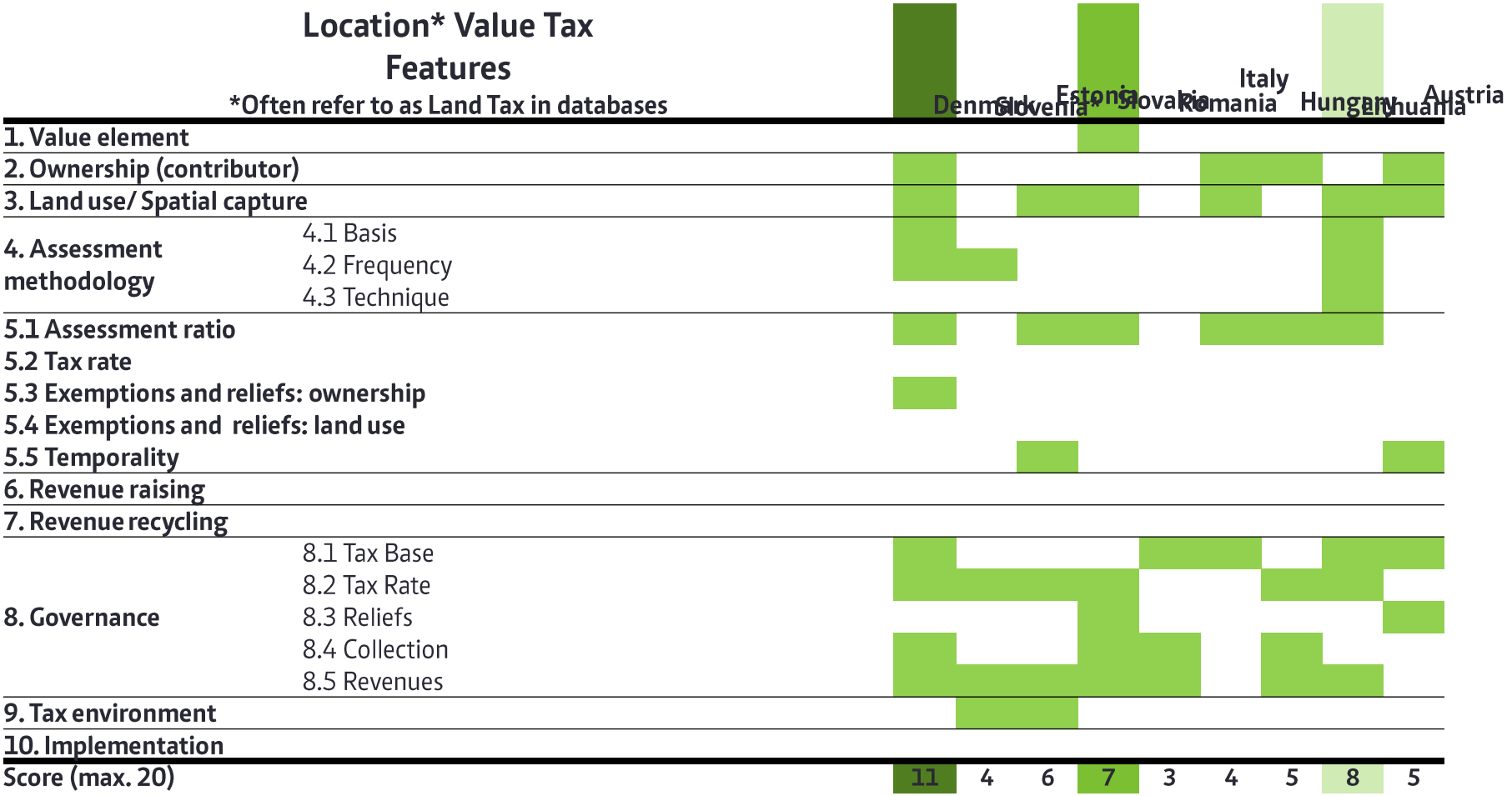
Appropriate policy design options for long-term sustainability



	Criterion	Sub-criterion	X
1. Tax base	Natural resources (N)		
	Private improvements: investment nearby (T)		
	Environmental Externalities (Q)		
	I Public/ Community intervention (C)		
	II Public intervention: Urban infrastructure (E)		
	III Public intervention: Land-use regulations (O)		
	Private improvements-owner: non-structural (M)		
	Private improvements-owner: structural (G)		
	Site Value (S) (T+Q+C+E+O1+M)		
	Location Value (LV) (T+Q+C+E+O)		X
	Land Value (H) (T+Q+C+E+O+M+N)		
2. Tax subject - Ownership	All urban owners (AUO)		X
	Private ownership (PO): Private owner-occupied (POo) and Private owner non-occupied (POn)		
	Legal Entities (LE): Legal Enterprise (LEn), Public (P) and Institutional (I)		
	Tenants/ Users (U)		
3. Tax subject - Location Use	All land uses (ALU)		X
	All Economically Usable Activities (AEU): Residential (RES); Commercial (BUSS); Industrial (IND); Scientific Parks (SPK)		
	Non-Economically Usable (NEU): Non-profit (NP); Religious (R); Education (EDU); Health (HEA); Public (P); Infrastructure provision (IP); Natural reserves (NR)		
	Location beneath buildings (L1)		
	Location not beneath buildings (L2)		
	Vacant building ground (V)		
4. Valuation method	3.1 Basis of assessment	Market value (MV) [HBPU]	X
		Area based assessment (ABA)	
		Cadastral value (CV)	
		Flat base (FB)	
		Location gains (LG)	
		Annual rents (AR)	
		Appraisal: HBPU	X
		Appraisal: Current Use (CU)	
	3.2 How to appraise	Traditional techniques: Abstraction (AB), allocation (ALL), teardowns (TD); Contribution (CON).	
		Sales Comparison (SC)	
		Self-Assessment (SA)	
		Massive Econometric Appraisals (MA); Computer Assisted Mass Appraisals (CAMA)	
		CAMA + GIS (CAMA-GIS)	X
	3.3 Frequency of assessment	< 5 years	X
		≥ 5 years	

	Criterion	Sub-criterion	X
5. Elements of differential taxation	5.1 Assessment ratio/ Liability base	< 50% total value	
		≥ 50% total value	X
	5.2 Tax rate [Normative]	Enough to raise revenues that cover admin. costs	X
		Enough to change behaviours	X
		Nondiscretionary rates	X
		Rate in relation to local year-to-year market value change/ CPI	X
	5.3 Exemptions and reliefs - Owner	No reliefs/exemptions (-)	X
		Assessment limits (AL)	
		General discretionary exemptions (GDE): Low Incomers (LI); Disabled (D); War Veterans (WV)	
		Mortgage interest deductibility (MID)	
		Tax deferral (TD)	
	5.4 Exemptions and reliefs - Land use	Exemptions based on area (ARE)	
		Conditional relief (CR): Relief if intended use is realized within a given period/ budgetary responsibilities	
		Pigouvian relief: site specific reasons (PR)	
		Types of land use (see 2.2)	
	5.5 Temporality	Permanent (PER)	
		Temporary (TEMP)	
6. Revenue raising	6.1 Tax liability	Minimum criteria: payment obligations cover administrative costs (≥30%)	X
	6.2 Collection [Normative]	$R_c \geq$ predefined value	X
		$R_l \geq$ predefined value	X
		$R_t(t)$ constant	X
7. Revenue recycling	Locally - Benefit view (BV)		
	Redistribution - New view (NV)		
8. Governance	8.1 Tax Base; 8.2 Tax Rate; 8.3 Reliefs; 8.4 Collection; 8.5 Revenues	Local Government (L)	X
		Regional or State (C)	
		State and Local (C/L)	
		Local within state set range (C(L))	
		Local within LUZ set range (LUZ(L))	X
9. Fiscal Environment	No taxes related to property (No)		X
	Additional taxes related to property (Yes)		
10. Implementation	10.1 Legal separation		X
	10.2 Taxpayer's right to require a revision of the valuation		X
	10.3 Explicit tax bills and revenue recycling		X
	10.4 Strong land use planning		X
	10.5 Coordination among tax offices		X
	10.6 Gradual introduction		X

The Triple Dividend of Location Value Capture Instruments



The Triple Dividend of Location Value Capture Instruments

	Denmark	Slovenia*	Estonia	Slovakia	Romania	Italy	Hungary	Lithuania	Austria
1. Charged event	SV	SV	H	LV	SV	SV	SV	SV	SV
2. Ownership	ALO	ALO + US	ALO - P	ALO + US	ALO + US	ALO	ALO	PO	ALO
3. Land use	ALU	V + L1	ALU	AEU	AEU - L1	V	L2 + V	ALU	V
4.1 Basis of assessment	MV	ABA	CV	CV	ABA	AR	ABA/ MV	CV	CV
4.2 Frequency (stipulated/ last)	2	1	6 (2001)	(2004)	n.a.	(1988)	n.a.	5 (2013)	n.a.
4.3 How to appraise	SC	CON	CON / SC	CON	CON	CON	SA	CAMA	n.a.
5.1 Assess. ratio (%)	81	n.a.	66	72	n.a.	100	50	100	n.a.
5.2 Tax rate (%)	2.60	n.a.	1.30	0.25	n.a.	0.4	1.5	1.5	1
5.3 Exemptions and reliefs: Ownership	NP; IP	P; LI	D; RES	R; NP; EDU; HEA	R; NP; EDU; HEA; WV; D	R; NP; EDU; HEA	n.a.	LI, D	-
5.4 Exemptions and reliefs: Land use	I	I; L1	RES (ARE); N	-	I; IND; SPK; N	-	RES (ARE); ZE	I; NR;	ZN
5.5 Temporality	PER	PER	TEM	PER	PER	PER	PER	PER	TEMP
6. Revenue raising	See Fig. 3								
7. Revenue recylcing	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
8.1 Tax Base	C	L	C/L	L	C	C	L	C	C
8.2 Tax Rate	C(L)	L	C(L)	LUZ(L)	C	C/L	L	L	C
8.3 Reliefs	C/L	L	C/L	L	C/L	C/L	L	C/L	C
8.4 Collection	L	C	C	L	L	C	L	C	C
8.5 Revenues	L	L	L	L	L	C/L	L	L	C
9. Additional PT	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
10. Implementation	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Score (max. 20)	**11**	**4**	**6**	**7**	**3**	**4**	**5**	**8**	**5**

Three motivation lines

E **Current environment of budgetary austerity** - fiscal policy appears to be moving away from centralized funds towards instruments that can be implemented at the regional and local scale.

S **Real estate markets in urban areas** – permanent value increase affects house affordability (wealth accumulation)

€ **Land/ Ecosystem degradation and scarcity** - crucial to address land use issues related to sustainability, including current urban land take patterns.

The Triple Dividend of Location Value Capture Instruments

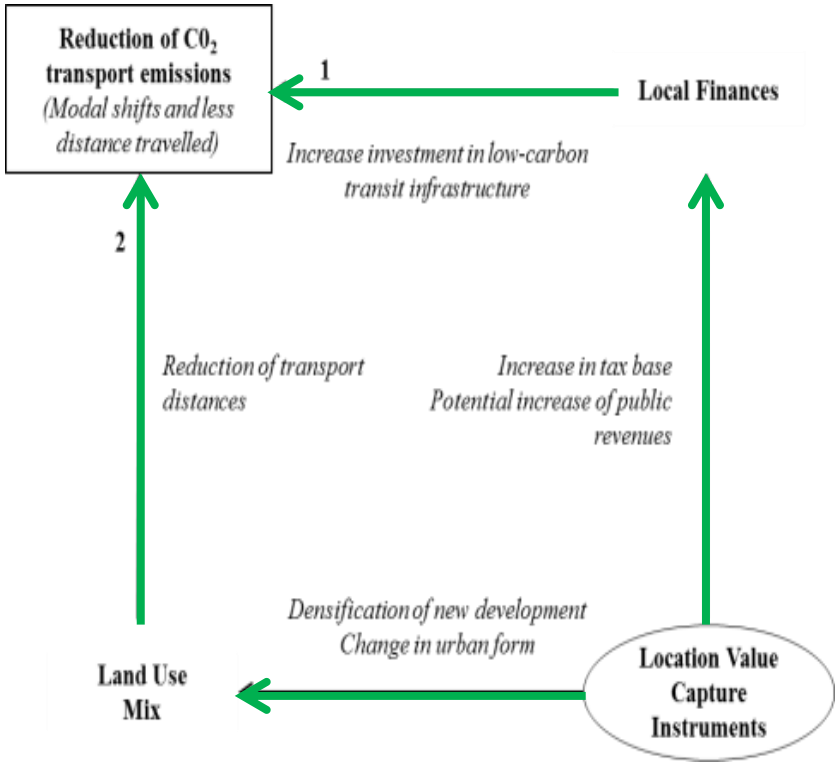
	Impact on		Observable effect	Expected outcomes
E	Supply prices	**Affected commodities**	***Land and housing prices***	Flattens the land-rent curve: Neutral or positive impact on housing/ urban land affordability.
E	Economic behaviour	**Demand side**	***Land and housing consumption***	Burdens urban land: decreases consumption [1]
			Investment behaviour, speculation	Burdens urban land: prevents speculative development [2]
		Supply side	Capital (intensity)	Eliminates excess burden: increase capital intensity per location surface [1] [3]
			Labour (intensity)	Increases the employment of labour
		Government revenues	[Normative]	**Value capture criteria:** (1)Covers a given share of capital investment and/or operations and maintenance costs (2)Ability to raise revenues at each cycle of value creation (3)Minimize financial risk of public investment
S	Individual welfare	**Horizontal and vertical equity**	[Normative]	**Equity criteria** (1) Benefits proportionality (2) Distributive effect (3) Ability to pay principle
S	Total welfare	**Spatial distribution of households**	***Segregation patterns***	Urban land accessibility

The Triple Dividend of Location Value Capture Instruments

Impact on		Observable effect	Expected outcomes
€ Local/ Global	**Land consumption**	City size, new development	Zero new urban land consumption per capita; Infill development [1]
		Time of development	Discourage earlier/ unsustainable development [2]
	Internalization of urban externalities	***Density concentration***	Increases capital intensity per developed surface [3]
		Environmental quality	Burden on pollution activities / Internalizes value of urban natural ecosystems
€ Local/	**Change in urban form (densification)**	Change in transport distances	Modal shift away from motorized vehicles: decreases negative effects from motorized modes/ Reduction of emissions
€ Global		Increased supply of public transit	Modal shift away from motorized vehicles: (L) decreases negative effects from motorized modes/ (G) Reduction of emissions

The Triple Dividend of Location Value Capture Instruments

The rationale for LVT



1 Financial source for low carbon transit

Recapture the added value of Real estate cycle before capitalization dynamics.

2 Shape urban development (core & fringe)

Densification and land use mix –increases efficiency – spill over transaction costs, QoL (compared with segregated settlements) polycentric structures and jobs dispersion.

3. Gentrification

- Transport monetary costs don't really go down with transit (e.g. semester ticket will be same/ higher price)
- Timing costs: Poor people prefer to have higher travel costs (preference: travel 20 min more than pay rent of 20 euros more)

4. Densification?

Do we really want that for the new cities to come?

Sustainability potential of LVT (vs. Property taxes)

	Environment	Equity	Efficiency
Focus	Land consumption Induced transportation	Who gets the benefits of what has been endowed to us – Henry George's argument	Non-distortive measure to adequately finance public goods
Why LVT yes	a) Incentives to make best possible use of land → denser development b) As land value is highest where accessibility is high, in-fill development trumps green-field development	Land rent taxes take the value of that what was endowed to us by nature, not the product of labour or investment	Stiglitz' Henry-George Theorem states that land rent taxation can finance public goods without distortive impact
Why PT not	Incentives to attach as much 'empty' land as possible to property → sprawl (more detailed argument in Bruckner and Kim, 2003)	Enable to reap the benefits of land value increases by purely social effects, not of individual effort	Leads to underinvestment into property, and possibly to spatial mismatches
Open Q.	Urban fringe / new urban zones: When applied to non developed land developers are encouraged to develop regardless market demand → sprawl	Benefit equity: Redistribution of welfare – through public investment. Ability to pay - Progressive?	Highest location values –@CBD (central politics and business district) → Taxing non residential LU?
	Institutional Feasibility		
Open Q.	Hard to determine land value in discrete markets Massive gains: creates a big temptation for powerful local and external elites to reap those gains away ...		

LVT in practice - Location Value Capture: Policy designs

	Criteria	
Principle	**Looking at**	**Description**
Value Capture	Capture timing	When? - Ability to finance upfront capital investment [Capital Investment stage (K) Operations and Maintenance stage (OM)]
	Loops capture	Raising tax revenue at each cycle
	Revenue volatility	Yield proportionality to the long-term trend growth/de-growth
	Revenue elasticity	Reflect increases in demand for new infrastructure financing
	O&M	Ability to support operation and maintenance expenditure in post-investment stage
Basic Features	Payee	Source of payment for investment [Land owner (L) Developer (D) User (U)]
	Enforcement & supervision	Authority responsible - Decentralization
	Location	Cover of the value creation area that arises due to public investment [On Site (OS) Restricted access (RA) full catchment zone (Z)]
	Incidence	Applies only to a new development or also to the existent one [New development (ND) existing development (ED)]
	Costs	What? - Allowance to raise financing for: [Capital Investment (K) Operations and Maintenance (OM)]
Risk Transfer	Risk bearer	Stakeholder holding the majority of the public investment financial risk Exchequer (E) General Public (P) Site owners(SO) Property owners (PO) Investors & Developers (D)
	Risk severity	Level of public investment financial risk [High (H) Medium (M) Low (L)]
	Risk timing	Warning system?
	Risk hedges	Does the instrument allow for risk correction?
Efficiency & Environment	Cost to contributor	Is the costs paid by contributors linked to benefits they receive?
	Benefits proportionality	Is the costs paid by beneficiaries proportional to actual value they gain?
	Optimization incentives	What incentives to optimize economic choices? Distortions? [Timing of development, Speculation, Transport modal shifts? Excess burden on land uses yield below maximal returns in market despite being associated with higher „non-market benefits"]
Equity	Fairness to Contributors	Distribution of benefits across different social groups
	Social Equity	Regressive - Progressive (payers perspective)
	Ability to pay	Incidence of burden of finance on various income groups
Institutional Feasibility	Transparency	Accountability to the contributor
	Enforcement Efficiency	Rates of compliance costs of collection and cost of administration

LVT in practice - Location Value Capture: Evaluation framework

Economic effects	
E.1	**Optimization incentives**
E.1.1	Supply prices
E.1.2	Capital + (labour) intensity
E.1.3	Timing of development
E.1.4	Burden non-market benefits
E.2	**Value capture**
E.2.1	Revenue adequacy (Public debt)
E.2.2	Risk adversity
E.3	Tax Interaction effect

Social effects	
S.1	Benefit proportionality
S.2	Distributive effect
S.3	Ability to pay
S.4	Land wealth redistribution
S.5	Housing affordability

Environmental effects	
EN.1	**Shape urban development**
EN.1.1	Urban land consumption
EN.1.2	Infill development
EN.1.3	Structural density
EN.1.4	Urban form (land use mix)
EN.2	**Internalization externalities**
EN.3	**Revenue recycling**

Implementation	
I.1	Political
I.2	Administrative

LVT in practice - Location Value Capture Instruments

Fiscal Instruments
Non-Fiscal instruments

Mechanisms	Description	Value Captured	When
Development Exactions & Impact Fees	Off-site costs of required infrastructure, service, administrative costs and depleted resources to service new development.	Public Intervention	Once – Fee Spread over a number of years - Exactions
Betterment Tax Special Assessment	Capitalization of Public Investment. Impose a levy on property owners near a new or improved public infrastructure, usually transport-related.		Once – Fee Spread over a number of years - Exactions
Public Land Selling / Leasing	Right to occupy and use publicly owned land.		Once Recurrent ("rent")
(1, 2) Recurrent Tax	Recurrent (annual) taxes on real (immovable) property or net wealth, based on the market or physical value of land.	Community-created value & Public Intervention	Recurrent
(3, 4) Transfer Tax	a) Inheritances b) Sales c) Transfers, registrations (stamp tax)		Once
Other Alternatives	Tax Increment Financing, Tax Base Sharing, Town Planning Schemes (i.e. TOD), Community Benefits Agreements, Utility Fees, Air Rights, Debt Financing of Infrastructure, Station Interface or Connection-Fee Programs, Science Parks.		Varies widely

LVT in practice - Location Value Capture: Evaluation framework

LVT in practice – Combination of instruments

Instrument	Spatially explicit effect	
	New Development	***Old Development***
i.e. Development tax [new development]	Reduction of urban sprawl	Reduction of in-fill development
	Reduction of long term CO2 transport	
	Reduction in the property tax base	Increase in the property tax base
	Equity reduction: wealth accumulation on pre-existing land owners	
	Equity reduction: scarcity in new housing	
Switch from PT to LV tax [developed land]		Increase of in-fill development
		Increase in tax revenues
	Tax Interaction effect: cuts in pre-existing distortion taxes (i.e. property taxes)	
	Equity enhancing: capture the increasing rents of prior land owners in the city and subsequent redistribution	
	Equity enhancing: housing promotion (residential land)	
Revenue Recycling effect	Increase investment in low-carbon transit infrastructure: Reduction of long term CO2 transport	

Chapter 5

Clean water and sanitation for all

Interactions with other Sustainable Development Goals

Evaluation criteria: variables for quantitative analysis

Based on evaluation framework "Influence of one SDG on another" from Nilsson et al., 2016

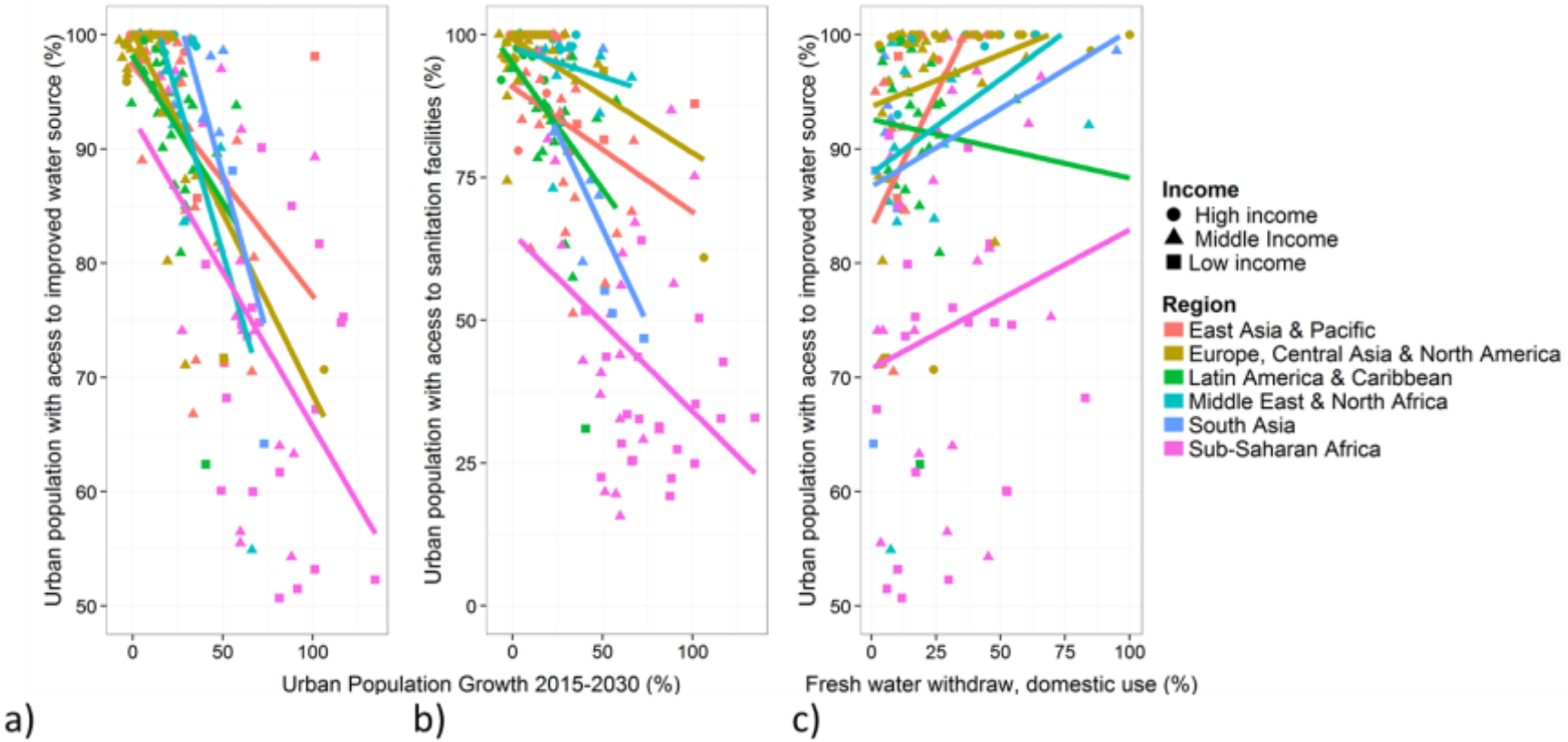
Quantitative analysis		
Interaction	Name	Explanation
+3	Indivisible	Inextricability linked to the achievement of another SDG
+2	Enforcing	Aids the achievement of another SDG
+1	Enabling	Created conditions that further another SDG
0	Consistent	No significant interactions
-1	Constraining	Limits options on another SDG
-2	Counteracting	Clashes with another SDG
-3	Cancelling	Makes it impossible to reach another SDG

Qualitative analysis			
Interactions with other SDGs		SDG6: Change in urban domestic water demand (%)	
SDG	Indicator	SDG moderate	SDG ambitious
2	2.1.1 Prevalence of undernourishment (% pop.)	Blue WF: Δ S0 - S1 (%)	Blue WF: Δ S0 – S2 (%)
2	2.3.2 Cereal yield (kg/ha)		
7	7.1.1 Electricity access (% pop.)		
6	6.3.1 Wastewater treatment (% of anthropogenic wastewater treated)	Grey WF: Δ S0 - S1 (%)	Grey WF: Δ S0 – S2 (%)
Difference between SDG moderate and ambitious scenario			
Δ S1-S2 blue (%)	Share (%) of total water available for domestic use (blue)		
Δ S1-S2 grey (%)	Share (%) of total water available for domestic use (grey)		

Influence of SDG6 on other SDGs

		SDG6							
SDGs		6.1	6.2	6.3	6.4	6.5	6.6	6.a	6.b
1	No poverty	3	3	0	2	0	R	1	2
2	Zero Hunger	-2	-1	0	R	2	R	1	2
3	Good health and well-being	3	3	2	R	2	0	0	0
4	Quality education	2	3	1	0	1	0	0	0
5	Gender equality	1	0	0	0	0	0	1	2
7	Affordable and clean energy	-1	-1	-1	2	2	-1	1	1
8	Decent work and economic growth	-2	-1	0	R	1	-2	1	1
9	Industry, Innovation and Infrastructure	-1	2	1	R	1	-1	1	1
10	Reduced inequalities	1	0	0	0	0	0	0	2
11	Sustainable cities and communities	3	3	3	2	3	0	1	2
12	Responsible consumption and production	-1	-1	2	2	2	0	1	1
13	Climate action	-1	-1	1	-1	2	2	2	1
14	Life below water	-1	-2	3	-1	2	3	1	1
15	Life on land	-2	-2	3	-2	2	3	1	1
16	Peace and justice, strong institutions	2	2	1	-1	1	1	1	1
17	Partnership for the SDGs	0	0	0	0	1	0	2	1

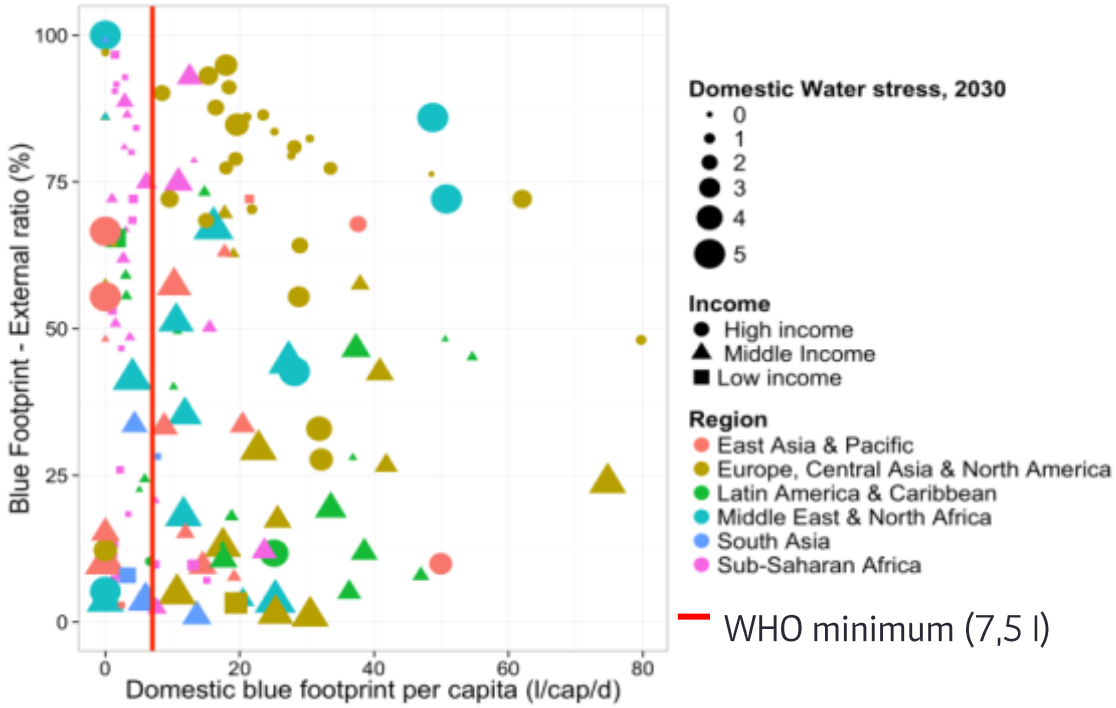
Targets 6.1&6.2 counteract with other water dependent SDGs



Higher increase in future demand (due to urban population growth) mostly in countries where:

a) Present today´s lower performance in SDG6
b) Domestic accessibility drastically affects fresh water withdraw
c) Limited financial resources (low and middle income countries)

Targets 6.1&6.2 counteract with other water dependent SDGs



In addition:

1. External water dependency + Water-scarce : **Problem!**
1. External water dependency + Water-scarce + Increase in demand **BIG Problem!**
   (a) Per capita – SDG ; b) Total – (Urbanisation)

Targets 6.1&6.2 counteract with other water dependent SDGs

Table 4. Interactions between SDG6 and other SDGs: statistical results (Pearson correlation coefficients and p-values (*significant at $p < 0.01$). (6[a]: crosscutting target, see section 3.1.4 for rationale).

		2030 Domestic water demand	
SDG	Indicator	S0-S1 (Blue WF)	S0-S2 (Blue WF)
2	2.1.1 Cereal yield (kg/ha)	-0.50*	-0.55*
2	2.3.2 Prevalence of undernourishment (% pop)	0.59*	0.66*
7	7.1.1 Electricity access (% pop)	-0.78*	-0.82*
Target 6.3		S0-S1 (Grey WF)	S0-S2 (Grey WF)
6[a]	6.3.1 Wastewater treatment	-0.58*	-0.60*
		Share of total water available for domestic use	
Scenario comparison		Blue WF	Grey WF
	% Change S1-S2 blue	0.28*	-
	% Change S1-S2 grey	-	0.62*

Back-up slides

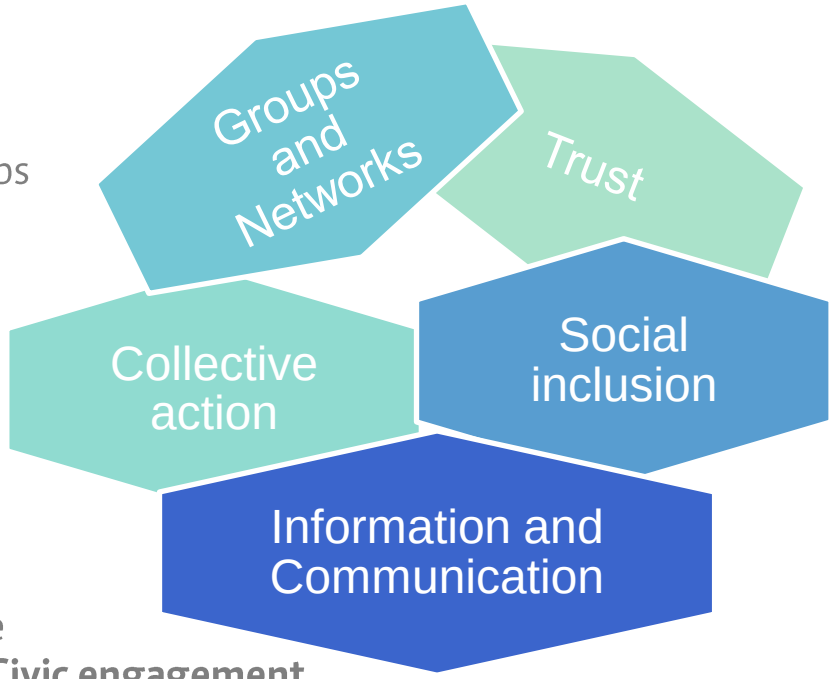
IV
Governance Structures for Urban Sustainability

Bonding networks
Linkages within a group that already has some affinity

Bridging networks
Linkages between groups

The Commons
Pooled community resources owned by no-one but used by all

Reciprocity & Altruism
Offering help to others without explicit expectation of this to be returned



Civic engagement and pro-activity

Individual´s perception of the **trustworthiness** of others within their community

Sense of collectively **shared values**

Ability to **communicate** among each other, with other communities and with members of their networks that live outside the community

Influencing Factors

Income & education levels

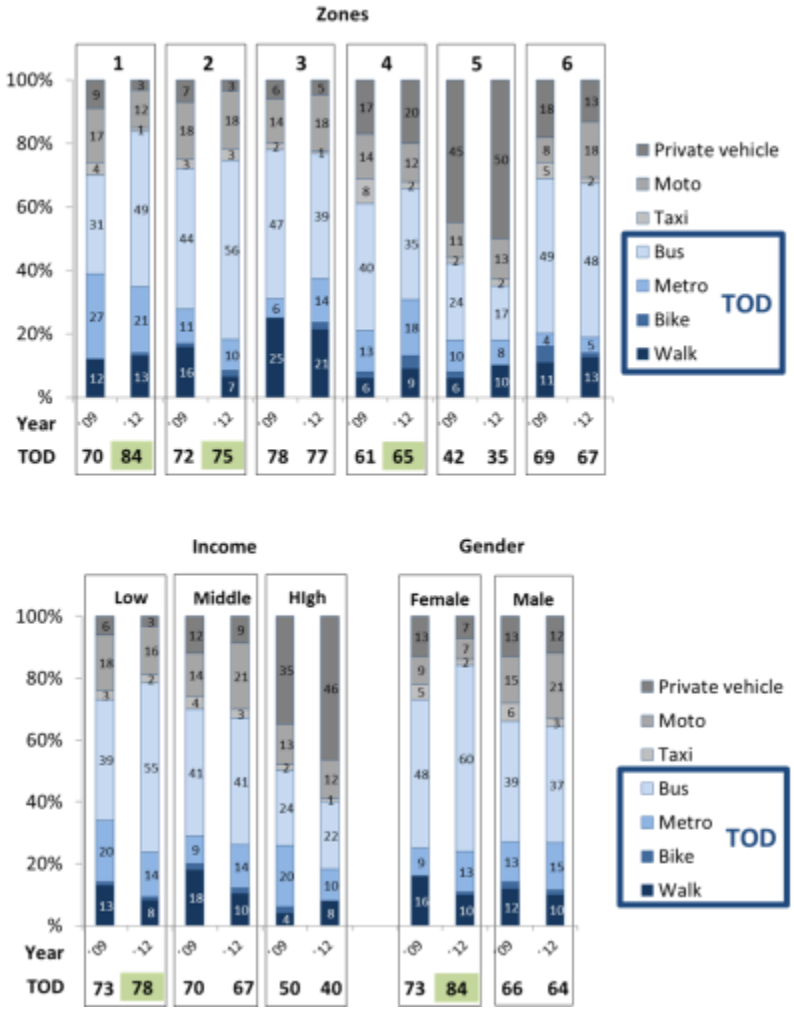
Social polarization

Existence and participation in organizations

Institutional structure

Chapter 9 Modal shares changes for the study groups

Modal shares changes between 2009 and 2012 for the study groups



Chapter 9

Topic category		Variable	Zones	Income	Gender
Socioeconomic variables	1	Housing			
	2	Education			
	3	Income			
Public Intervention	4	Education (satisfaction)			
	5	Environment			
	6	Health			
	7	Public Infrastructure			
	8	Public space			
	9	Transit			
Social Capita	10	Collective action			
	11	Groups and Networks			
	12	Inf. & Commun.			
	13	Social inclusion			
	14	Trust			
		Socioeconomic variables			
		Public Intervention			
		Social Capita			
		Total			

Chapter 9

			Zones						Income			Gender	
Variables			1	2	3	4	5	6	Low	Middle	High	Female	Male
Socioeconomic variables	1	Housing	**-0.05**	**0.04**	**0.09**	0.19	0.01	-0.30	**0.31**	-0.12	**-0.38**	**0.77**	-0.12
	2	Education	0.01	-0.04	0.03	-0.02	**0.02**	**0.00**	0.02	-0.04	**-0.03**	0.05	-0.04
	3	Income	**0.03**	**-0.01**	**0.01**	0.01	0.00	**-0.03**	**0.02**	-0.01	-0.01	**0.00**	**0.02**
Public Intervention	4	Education (satisfaction)	**0.01**	0.01	-0.06	**0.08**	0.00	**-0.04**	**0.01**	**-0.02**	**0.04**	0.01	**-0.01**
	5	Environment	-0.01	0.06	**-0.02**	**0.14**	-0.06	-0.10	-0.01	**0.01**	0.06	0.03	0.00
	6	Health	**0.02**	**0.00**	-0.09	**0.01**	0.12	-0.07	**0.00**	**-0.03**	0.08	**0.00**	**-0.02**
	7	Public Infrastructure	**0.00**	**0.03**	**0.03**	-0.03	-0.01	-0.01	**0.02**	-0.01	-0.04	**0.01**	0.00
	8	Public space	**0.05**	-0.07	-0.04	**0.04**	-0.04	**0.06**	**0.00**	0.00	**0.05**	**0.02**	**0.00**
	9	Transit	**0.06**	-0.03	-0.10	**0.07**	-0.05	**0.07**	**0.05**	-0.01	-0.02	**-0.01**	**0.01**
Social Capita	10	Collective action	0.10	**-0.01**	-0.20	**0.14**	-0.03	**0.02**	**-0.03**	-0.03	-0.01	**0.08**	-0.03
	11	Groups and Networks	**0.04**	-0.08	**-0.15**	0.30	0.10	**-0.26**	**0.38**	**-0.02**	0.29	**0.04**	-0.09
	12	Inf. & Commun.	**0.11**	-0.07	-0.01	-0.03	-0.02	**0.04**	**0.09**	-0.05	-0.04	**0.01**	-0.03
	13	Social inclusion	**0.10**	0.05	-0.07	**0.00**	-0.07	**0.01**	**0.13**	**-0.03**	-0.06	**0.05**	0.01
	14	Trust	0.02	**0.08**	-0.03	**0.03**	-0.05	-0.03	**0.04**	**-0.01**	**-0.06**	0.02	**0.00**
Socioeconomic variables			**0.01**	**-0.01**	**0.03**	0.03	0.02	**-0.07**	**0.06**	-0.04	**-0.10**	**0.15**	**-0.03**
Public Intervention			**0.02**	0.00	-0.05	**0.04**	-0.01	**-0.01**	**0.01**	-0.01	**0.02**	**0.01**	**0.00**
Social Capita			**0.07**	**0.01**	-0.09	**0.06**	-0.03	**-0.01**	**0.07**	-0.03	-0.01	**0.04**	-0.02
Total			**0.03**	0.00	-0.03	0.05	-0.01	**-0.03**	**0.04**	-0.03	-0.03	**0.07**	-0.02

Note: Bold border: groups where TOD has increased; grey sharing: positive % change 2009-2012; bold format: 2009 values below Medellin average.

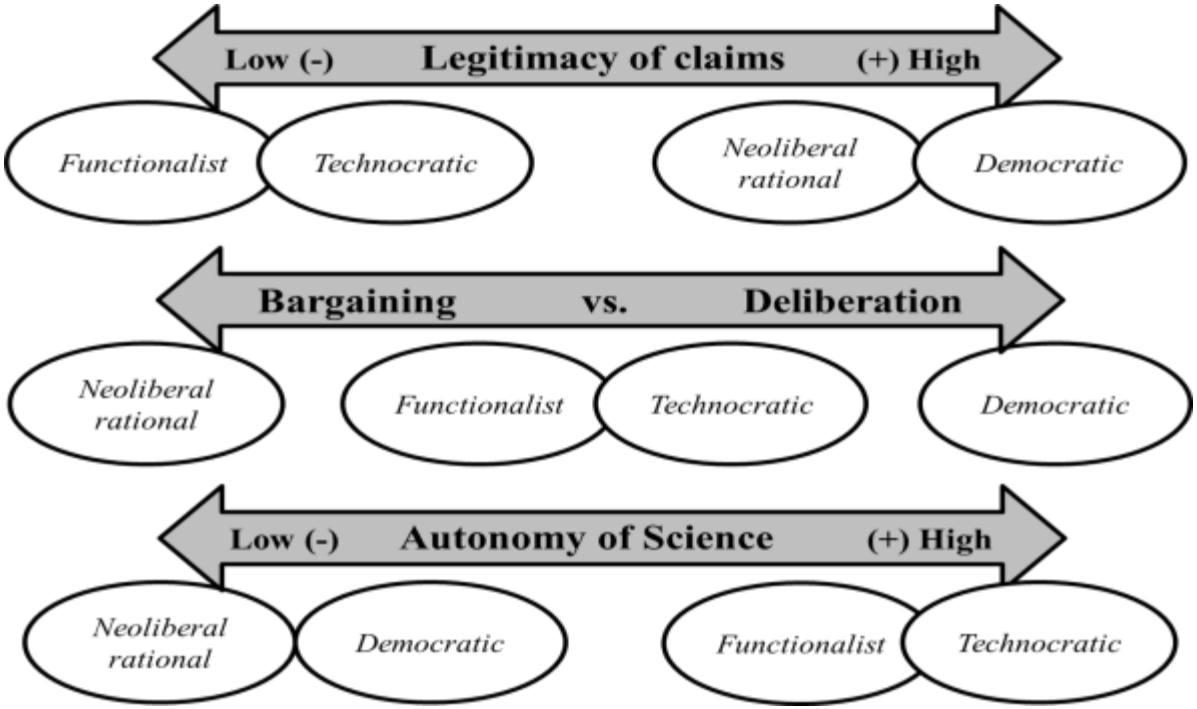
Chapter 9

	Variables	Values	Zones				Income				Gender			
			score_n		score_d		score_n		score_d		score_n		score_d	
			TOD	n-TOD	TOD	n-TOD	TOD	n-TOD	TOD	n-TOD	TOD	n-TOD	TOD	n-TOD
1	Housing	M	0.6	0.05	0.02	-0.03	0.35	-0.26	0.31	-0.25	0.91	-0.03	0.77	-0.12
		z; p	0.84; 0.40		1.01; 0.31		2.32; 0.02		2.32;0.02		1.96; 0.05		1.96; 0.05	
2	Education	M	-0.05	-0.03	-0.01	-0.01	-0.04	-0.08	0.02	-0.02	-0.04	-0.07	0.02	-0.07
		z; p	-0.66; 0.51		-0.57; 0.57		1.03; 0.30		1.03; 0.30		1.09; 0.27		1.53; 0.13	
3	Income	M	0.02	0.00	0.00	-0.02	0.01	0.01	0.00	-0.01	0.01	0.03	0.00	0.01
		z; p	0.44; 0.66		1.06; 0.29		0.37; 0.71		0.98; 0.33		-0.31; 0.75		0.31; 0.75	
4	Education (satifaction)	M	-0.05	-0.09	0.01	-0.04	-0.05	-0.05	0.01	0.01	-0.05	-0.06	0.01	-0.01
		z; p	1.96;0.05		1.94; 0.05		0.00; 1.00		0.00; 1.00		1.00; 0.32		1.00; 0.31	
5	Environment	M	0.10	-0.01	0.06	-0.03	0.01	0.05	-0.02	0.05	0.03	0.02	0.01	0.00
		z; p	*3.33; 0.00**		*3.61; 0.00**		-1.38; 0.17		*-3.63; 0.00**		0.41; 0.68		1.17; 0.25	
6	Health	M	-0.08	-0.09	-0.03	-0.04	-0.05	-0.04	0.00	0.00	-0.06	-0.05	0.00	-0.02
		z; p	0.49; 0.63		0.84; 0.40		0.26; 0.79		0.26; 0.80		-0.22; 0.83		0.65; 0.51	
7	Public Infrastructure	M	0.04	0.02	0.00	0.00	0.06	0.01	0.01	-0.01	0.03	0.04	0.01	0.00
		z; p	0.18; 0.85		0.64; 0.52		1.62; 0.10		*3.62; 0.00**		0.85; 0.40		1.56; 0.12	
8	Public space	M	0.00	-0.02	0.05	-0.01	0.01	0.02	0.03	-0.01	-0.02	-0.01	0.02	0.00
		z; p	-0.01; 0.99		1.53; 0.12		-0.13; 0.90		0.78;0.43		0.32; 0.75		0.99; 0.32	
9	Transit	M	0..02	-0.06	0.04	-0.03	0.02	-0.03	0.03	-0.01	-0.03	0.00	-0.01	0.01
		z; p	*2.95; 0.00**		*3.07; 0.00**		*2.86; 0.00**		*2.71; 0.00**		-1.47; 0.14		-2.83; 0.01	
#	Collective action	M	0.06	-0.08	0.09	-0.05	-0.04	-0.04	-0.02	-0.03	0.07	-0.06	0.06	-0.04
		z; p	*2.75; 0.00**		*3.04; 0.00**		0.00; 1.00		0.28; 0.78		1.92; 0.05		1.76; 0.07	
#	Groups and Network	M	0.15	-0.12	0.15	-0.14	0.31	0.15	0.15	0.12	0.08	-0.03	0.05	-0.12
		z; p	*4.05; 0.00**		*4.33; 0.00**		1.11; 0.27		0.92; 0.36		1.85; 0.06		*3.77; 0.00**	
#	Inf & Communication	M	0.07	-0.02	0.03	-0.02	0.06	-0.03	0.05	-0.03	0.03	-0.04	0.02	-0.03
		z; p	1.50; 0.13		0.95; 0.34		*3.06; 0.00**		*2.94; 0.00**		1.14; 0.25		1.80; 0.07	
#	Social Inclusion	M	0.09	-0.01	0.05	-0.04	0.12	0.00	0.07	-0.04	0.08	0.06	0.03	0.02
		z; p	*4.73; 0.00**		*5.60; 0.00**		*3.94; 0.00**		*5.74; 0.00**		1.49; 0.14		1.24; 0.22	
#	Trust	M	0.09	-0.01	0.03	-0.03	0.08	0.02	0.03	-0.01	0.08	0.07	0.01	0.01
		z; p	*3.20; 0.00**		*3.61; 0.00**		2.38; 0.01		*3.27; 0.00**		0.28;0.77		0.41; 0.68	
Socioeconomic variables		M	0.17	0.01	0.01	-0.02	0.12	-0.04	0.05	-0.04	0.21	-0.04	0.15	-0.08
		z; p	0.74; 0.46		0.76; 0.45		2.39; 0.02		*3.37; 0.00**		1.89; 0.06		2.42; 0.02	
Public Intervention		M	0.03	0.00	0.02	-0.01	0.02	0.00	0.01	0.00	0.01	0.01	0.00	0.00
		z; p	2.53; 0.01		*4.22; 0.00**		0.95; 0.34		1.77; 0.08		0.22; 0.83		0.8; 0.43	
Social Capita		M	0.09	-0.02	0.05	-0.04	0.11	0.00	0.06	-0.02	0.07	0.02	0.02	0.00
		z; p	*7.13; 0.00**		*7.50; 0.00**		*5.07; 0.00**		*6.07; 0.00**		*2.96; 0.00**		*3.98; 0.00**	
Total		M	0.05	-0.01	0.03	-0.02	0.07	0.00	0.04	-0.01	0.05	0.01	0.01	0.00
		z; p	*6.93; 0.00**		*8.46; 0.00**		*4.71; 0.00**		*6.64; 0.00**		*2.82; 0.00**		*4.05; 0.00**	

Chapter 10 Stakeholder involvement in Sustainability Science

	Research questions	Stakeholders	Research process	Kind of results	Kind of projects
Technocratic type	Generation: Scientifically identified gaps in research Content: Technical questions of the energy transition (wind and solar power, transmission, financial products)	Technical experts (planners, engineers, other scientists)	Generation: Scientists collect and evaluate information without direct influence of stakeholders Content: empirical data and information	Generation: No support of implementation, solely scientific communication of results Content: market assessments, technical feasibility studies	Pathways, case studies, scenarios, technical projections
Neoliberal-rational type	Generation: result of bargaining process of interest groups (including scientists) of the energy transition Content: questions concerning societal needs and particular interests, policy demands, opinions/values	All stakeholders with interest in energy transition (Corporations negatively/ positively affected, citizen initiatives, Policy makers, NGOs, Lobby organizations)	Generation: scientists interpret/evaluate stakeholders' positions during all steps of the research process Content: opinions, information, values, interests	Generation: support of implementation to bring results into the political or societal arena (incl. media) Content: policy recommendations, studies	Scenarios (decentralized/ centralized, role of efficiency, technology development, role of nuclear energy) opinion polls, events, studies
Functionalist type	Generation: Scientifically identified problems Content: questions integrating social dimension of energy transition into science system	Powerful (and thus vocal) stakeholders from all affected social sub-systems: politics, economy, science, civil society	Generation: scientists involve 'representative stakeholders in all stages of research process to irritate science system with other social perspectives (random generator) Content: system-specific knowledge	Generation: enhance probability of self-reflective processes in the science and implementing systems through 'readable' framing and good timing Content: translated knowledge such as science-based policy recommendations	Studies, events, workshops (Bayesian Risk assessments for investments in different forms of energy production; social acceptance of new technologies (demand-side management, electric cars)
Democratic type	Generation: socially relevant problems arising from dialogue process Content: problems that hinder the energy transition/ questions that integrate needs of all stakeholders supporting the energy transition	All stakeholders affected by energy transition (Corporations, citizen initiatives, Policy makers, NGOs, Lobby organizations, citizens)	Generation: scientists take into account stakeholders' positions during all steps of the research process Content: opinions, information, values, interests.	Generation: support of implementation through dialogue with stakeholders Content: policy recommendations, studies, opinion polls, assessments	Scenarios (decentralized/ centralized, role of efficiency, technology development, role of nuclear energy) opinion polls, events, studies

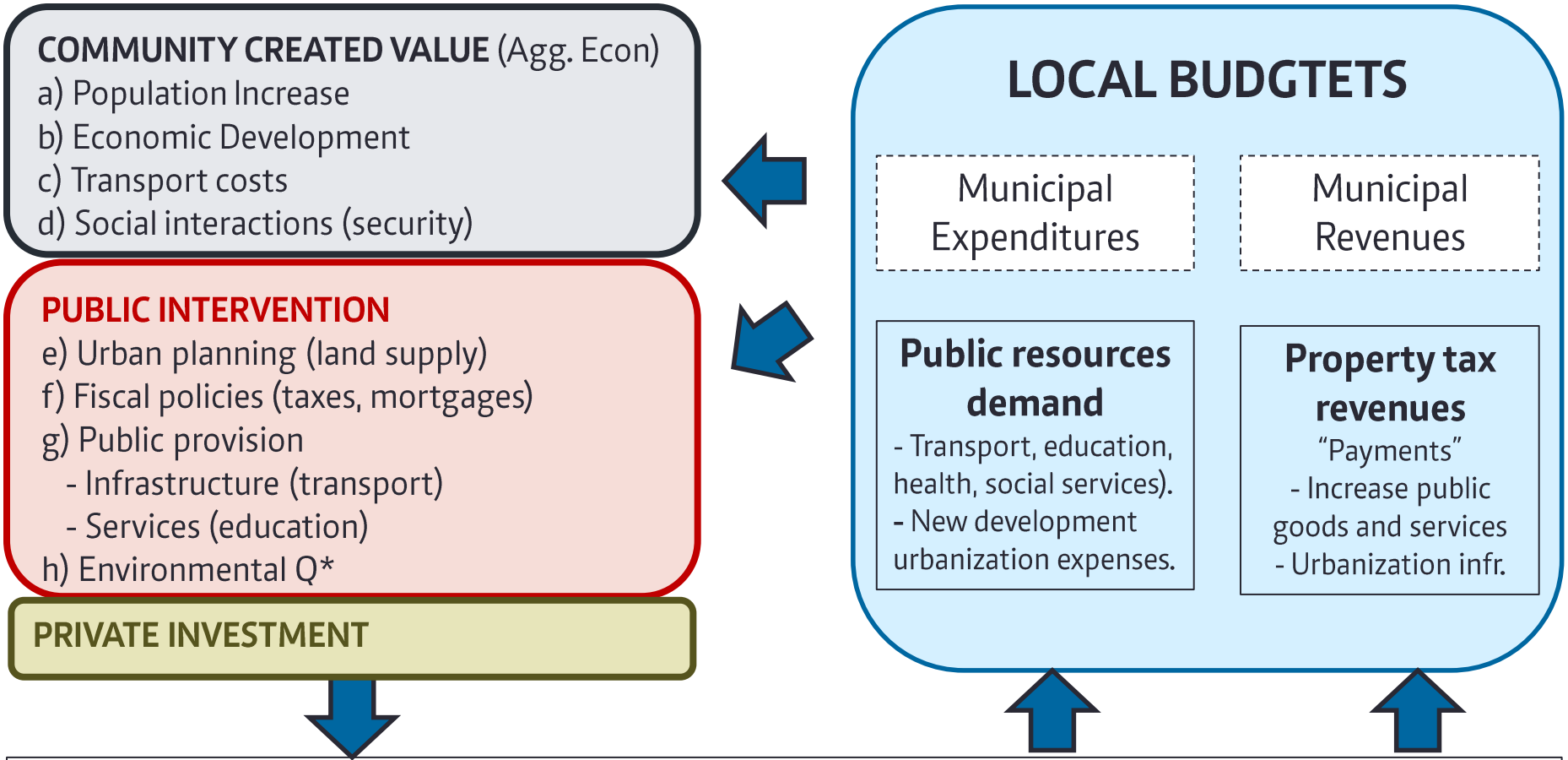
Chapter 10 Stakeholder involvement in Sustainability Science



Back-up slides

Policy relevance of LVT

Urban Development and Municipal Finances



Efficiency – Equable:
Henry George: A Single Tax on Land (George, 1979)

1. Economic efficiency

As there is no costs in the provision of land (labour & transactional costs), taxing away rents does not harm the economy or distorts markets.

2. Social Justice (equitability)

*Land value increase results from **change in use of land**, **from public investment** or decision, or due to the **general growth of the community** (UN´s Vancouver Action Plan, 1976).*

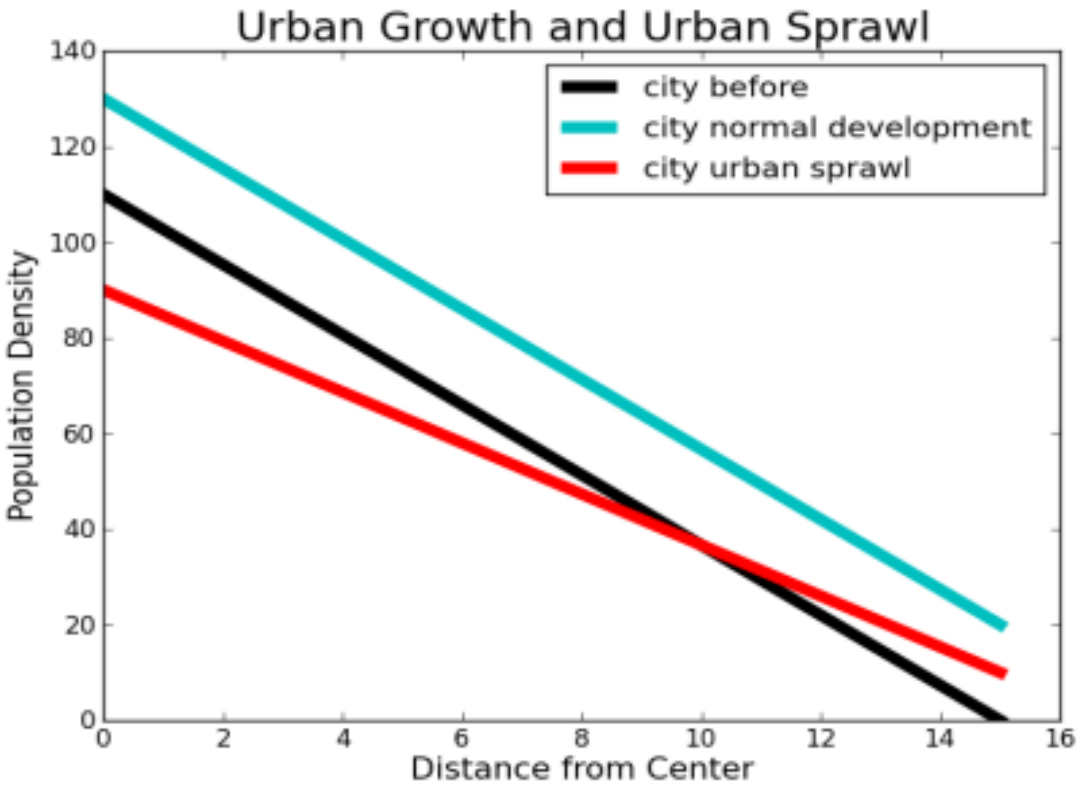
HG´s Proposition: Expenditure on public goods equals the differential land rent

Local public goods are best financed by internalizing the land rent differential (difference between land value with and without public goods).

***Taxation** should not be seen only as a source of revenue for the community but also as a **powerful tool** to encourage development of desirable locations, to **exercise a controlling effect** on the land market and to redistribute to the public at large the benefits of the unearned increase in land values."*

UN-HABITAT, 1976

Sprawl


Urban Growth and Urban Sprawl
city before
city normal development
city urban sprawl
Population Density
Distance from Center
0
20
40
60
80
100
120
140
0
2
4
6
8
10
12
14
16

Sprawl: Urban Land Cover 2010-2050 for different Regions

Assumption 1: Annual Density Decline = 0%

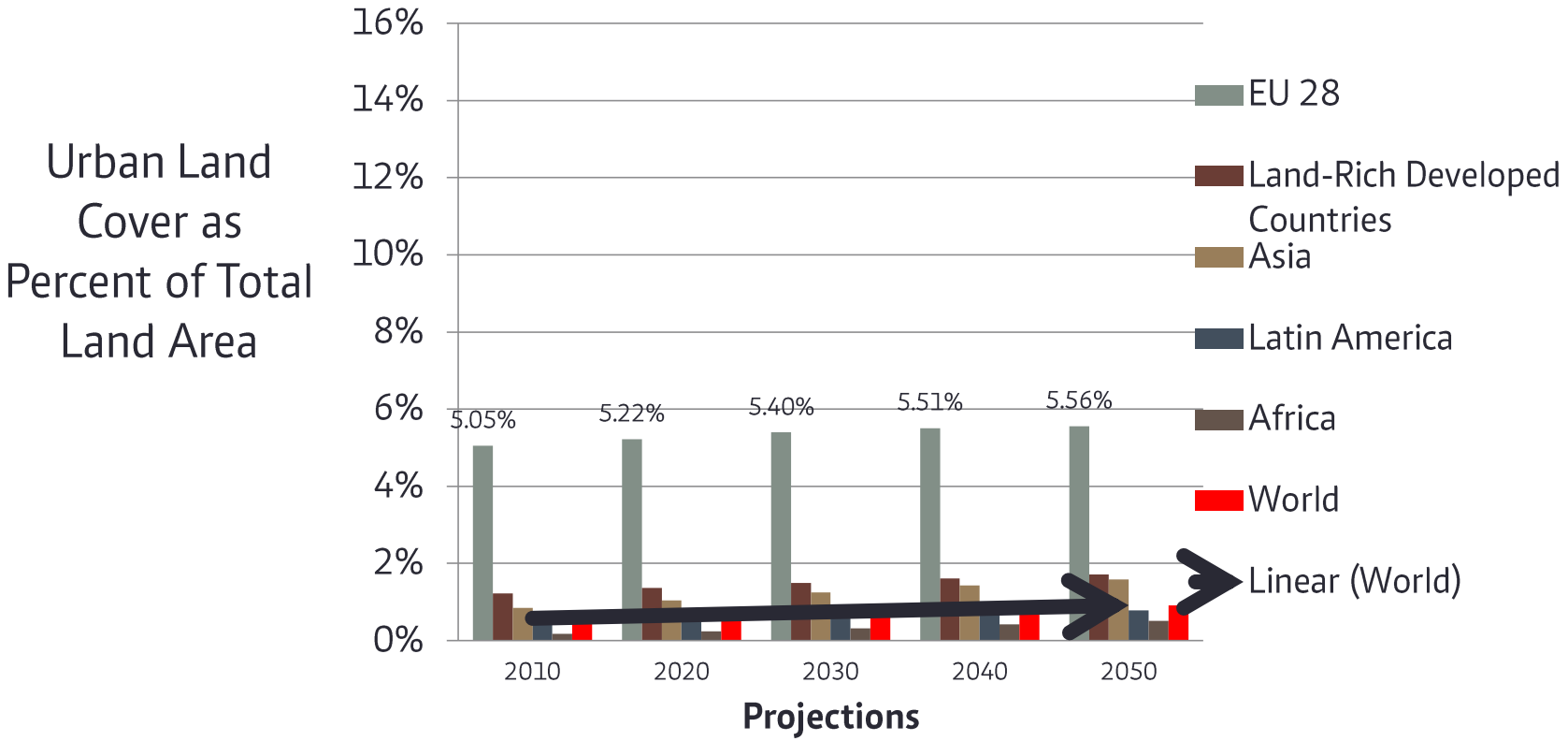


Fig 1. Urban Land Cover 2000-2050 (Source: Self-calculation using data from Atlas of Urban Expansion (Angel etl all., 2010)

Sprawl: Urban Land Cover 2010-2050 for different Regions

Assumption 2: Annual Density Decline = 1%

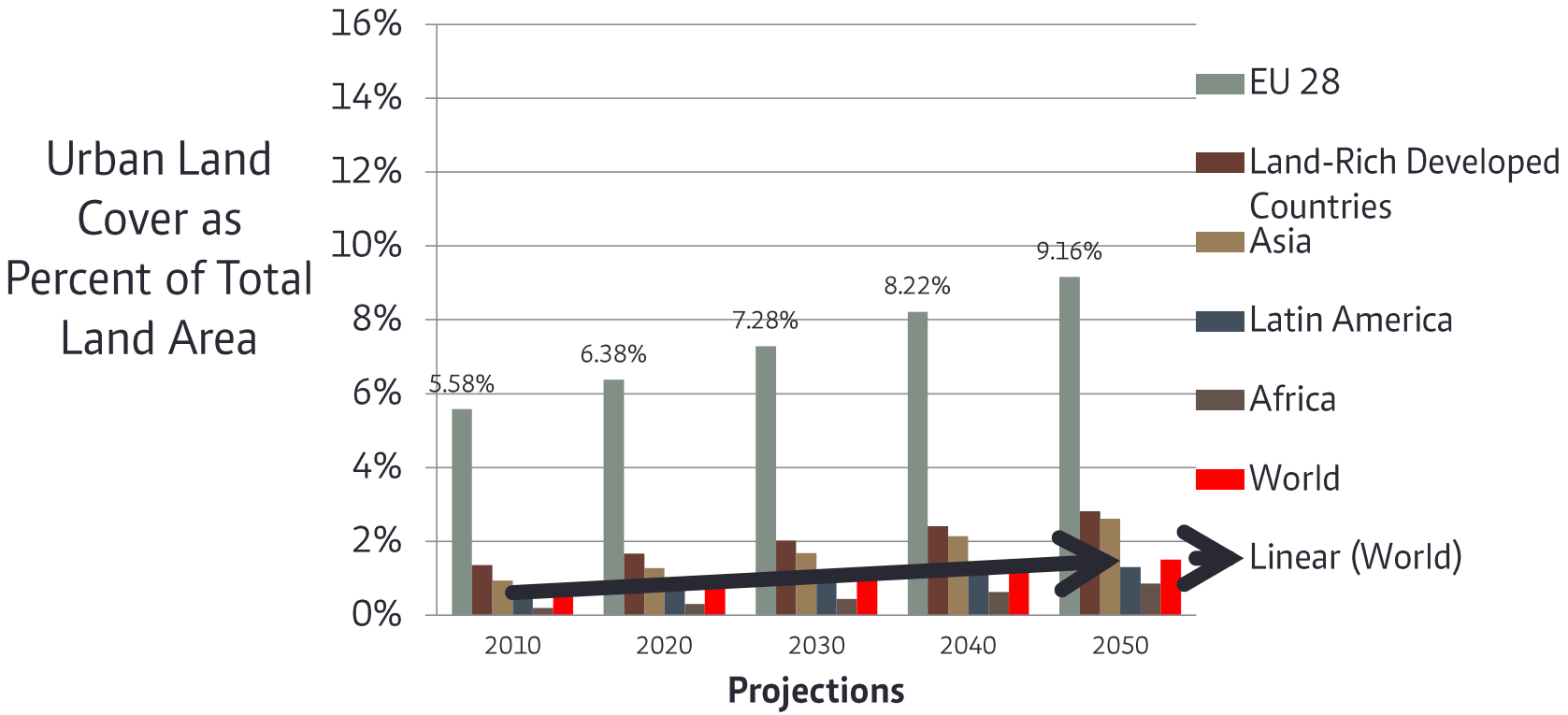


Fig 2. Urban Land Cover 2000-2050 (Source: Self-calculation using data from Atlas of Urban Expansion (Angel etl all., 2010)

Sprawl: Urban Land Cover 2010-2050 for different Regions

Assumption 3: Annual Density Decline = 2%

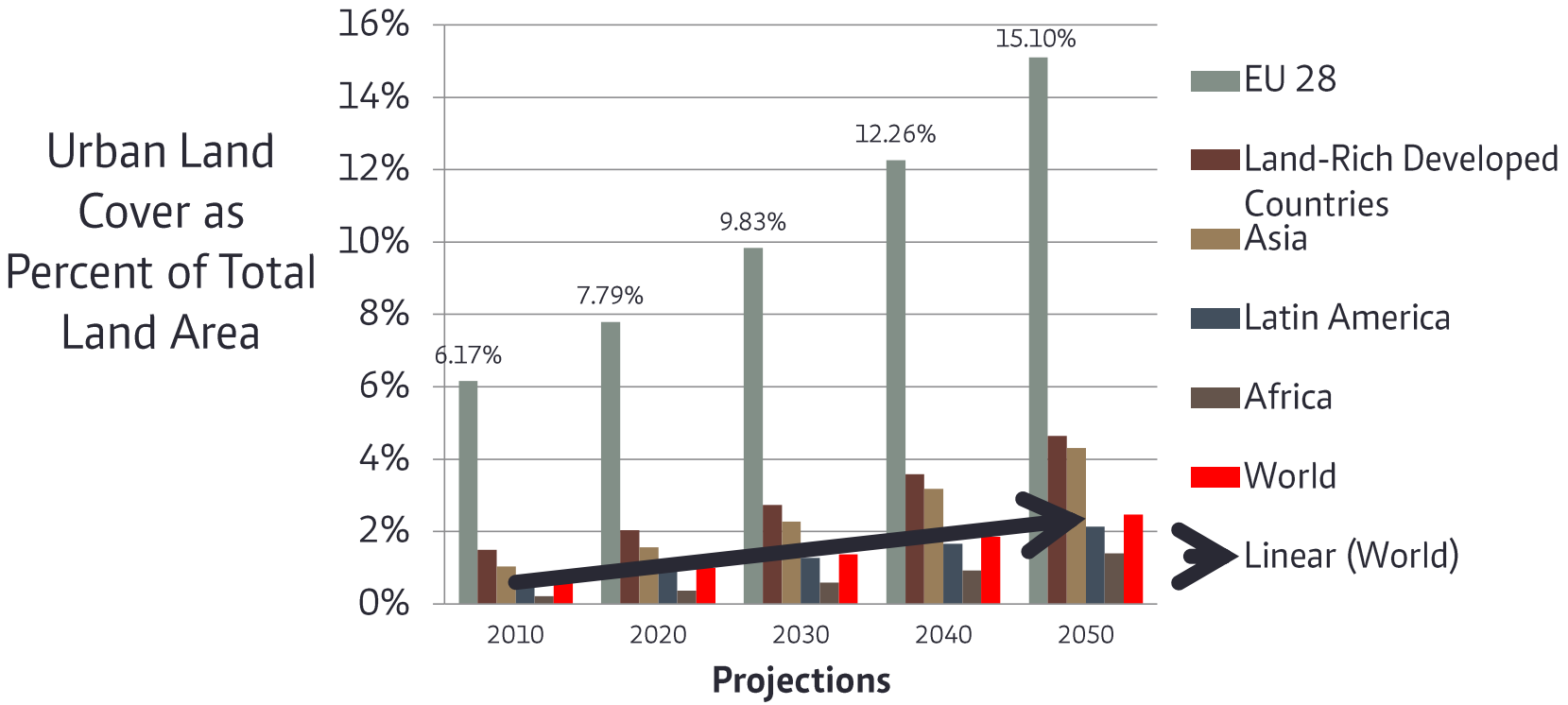
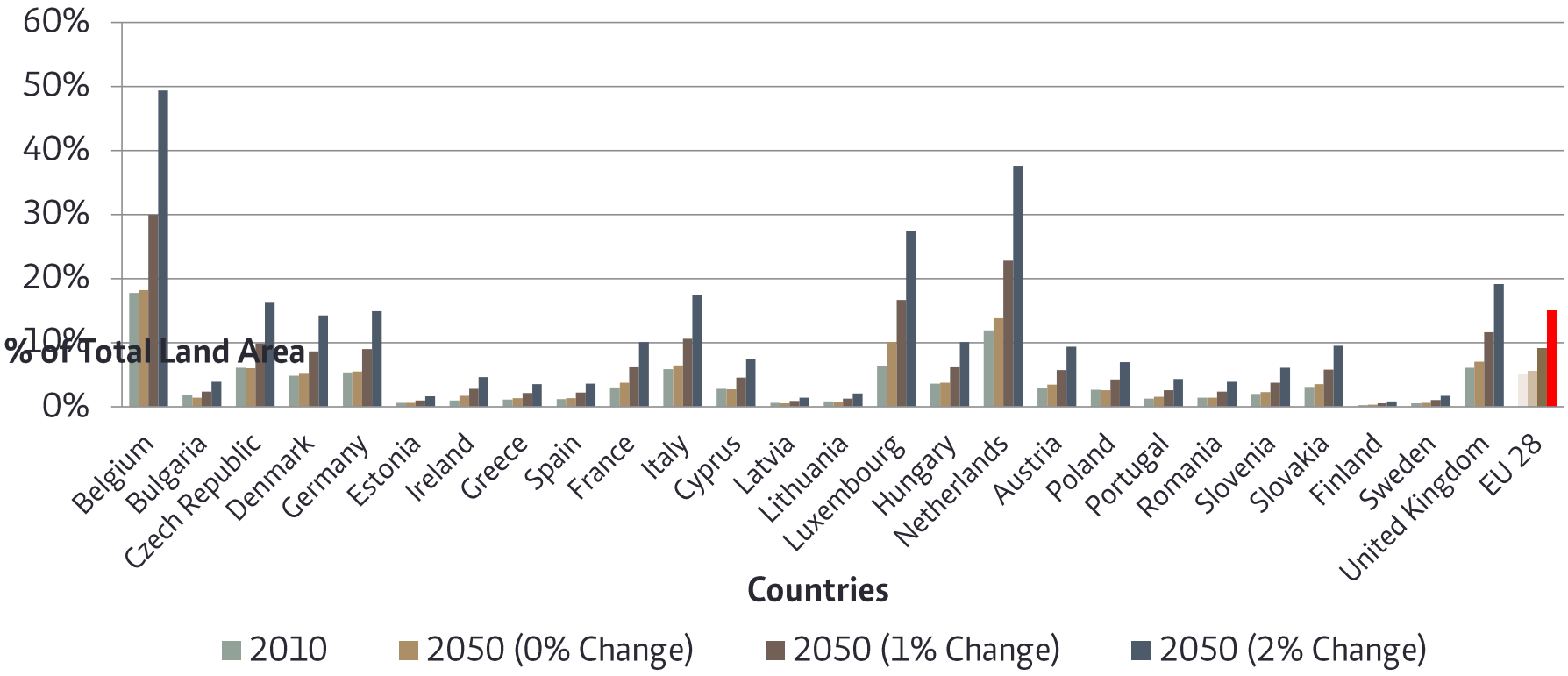


Fig 3. Urban Land Cover 2000-2050 (Source: Self-calculation using data from Atlas of Urban Expansion (Angel etl all., 2010)

Urban Land Cover 2010-2050 EU 27 for 0, 1 and 2 percental change in declining density



Back-up slides

Super Mayor

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