Green Urban Development – A Framework for Integrating Biodiversity and Ecosystem Services, Natural Capital Accounting and Natural Infrastructure

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putting economics to good use

The concept note summarises approaches to natural infrastructure, biodiversity and natural capital accounting and their integration for cities

Overview of topics:

- Natural assets and green infrastructure
- Biodiversity in cities
- Natural capital accounting
- Integrating these concepts

After the presentation of the concept note, we will discuss:

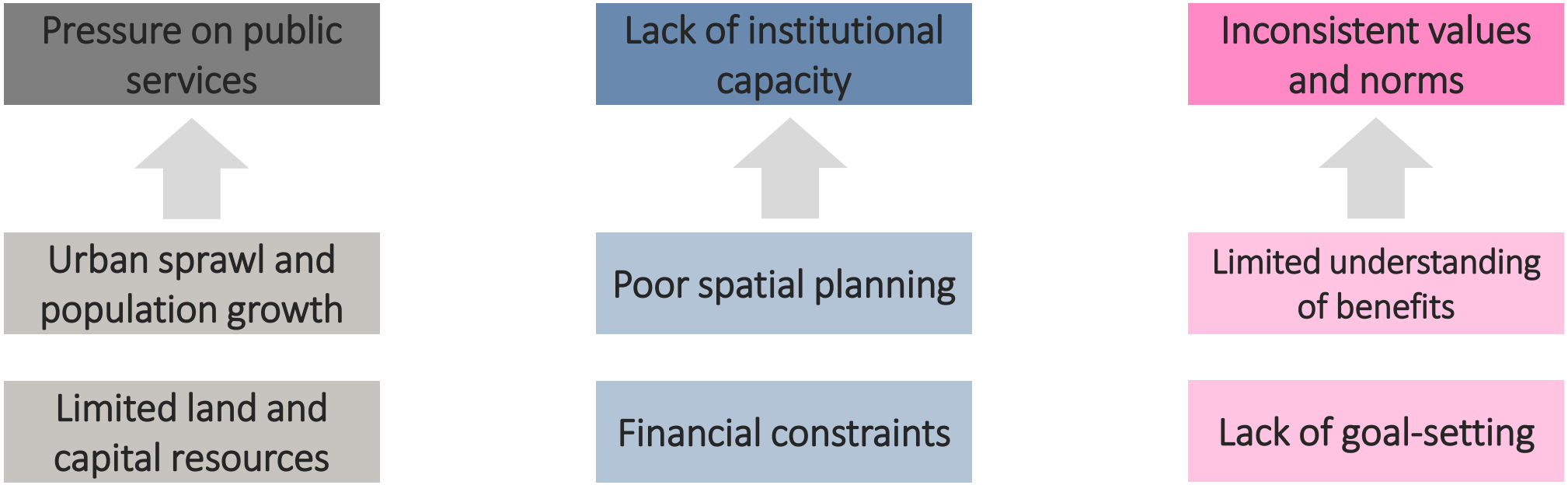
1. How can city biodiversity, natural capital accounting, and natural infrastructure contribute to a city's green vision?

2. What are the key challenges of incorporating these issues into urban planning process?

Green urban development describes the objectives cities pursue to improve the lives of their residents

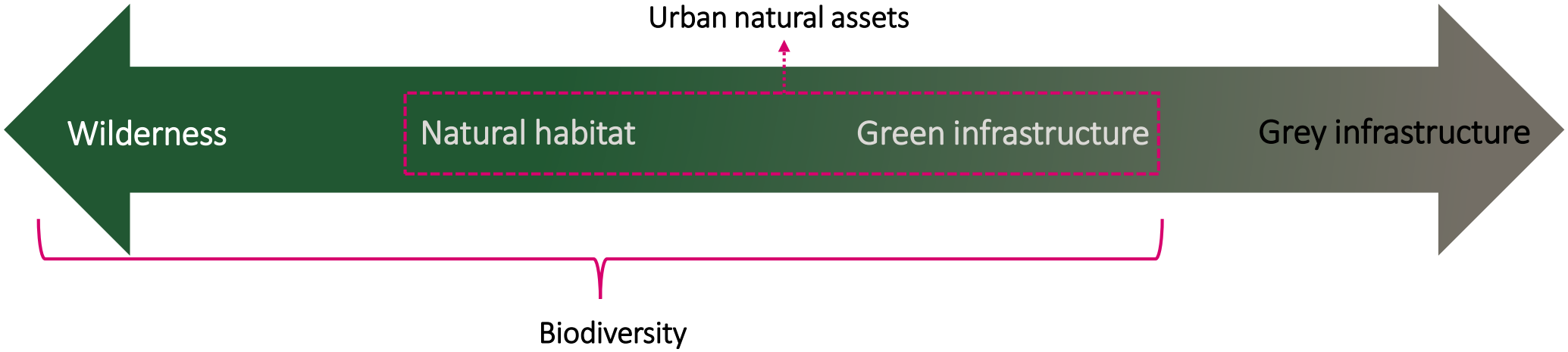
Source: Vivid Economics

Cities are often constrained in their ability to provide public goods necessary for green development



Source: Vivid Economics

Natural assets are stocks of nature inside and outside the city



Wilderness	Rainforest, desert, deep ocean
Natural habitat	Rivers, woodlands
Green infrastructure	Urban parks, constructed wetlands
Grey infrastructure	Roads, buildings, bridges, dams, pipes

Natural assets produce a set of services that benefit city residents

Stock of natural assets		
Parks	Waterbodies	Street trees

Flow of services

Provisioning services	Regulating services	Habitat services	Cultural services
• Food • Timber	• Climate stability • Air and water quality	• Genetic and species biodiversity • Pollinators for agriculture	• Recreational activity • Tourism • Place-making

Value of services

Benefits to individuals, business and public sector

Source: Vivid Economics and Brander and Eppink (2012)

Different types of green infrastructure can be deployed by cities to pursue their own green development ambitions

	Green Infrastructure	Cultural					Regulating	Provisioning	Option Values
		Recreation	Physical activity	Tourism	Aesthetic, place making	Spiritual, educational	Soil, water, air quality, carbon	Food, water	Bequest, intrinsic
Small built features	Green roof/wall				●		●		
	Green corridor		●		●		●		
	Street trees				●		●		
	Small greenspace	●			●		●		
	Water features	●		●	●		●		
Other green areas	City farms	●		●		●	●	●	
	Public squares, commons	●	●	●	●		●		
	Sports pitches	●	●						
	Public/domestic gardens	●			●	●	●	●	
Parks	Local parks	●	●	●	●	●	●		●
	Regional/national parks	●	●	●	●	●	●		●
Natural features	Wetlands, rivers	●				●	●	●	●
	Woodland					●	●		●

Source: Vivid Economics and Natural England (2009)

● = primary benefit ● = secondary benefit

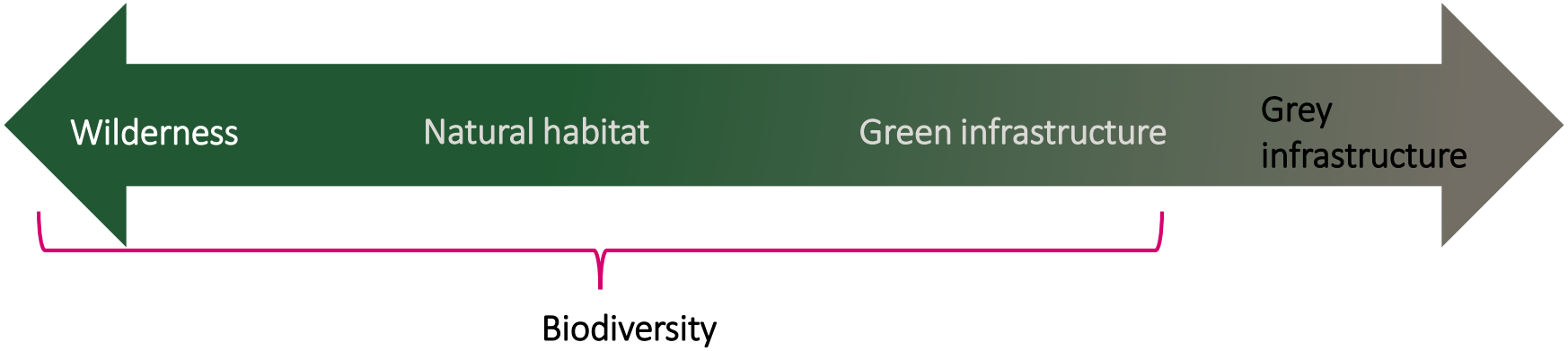
Biodiversity describes variability within and between species and across ecosystems

Biological variability of an ecosystem refers primarily to three types of diversity:

1. Diversity within species
2. Diversity between species
3. Diversity of ecosystems

Biodiversity is a feature of some types of green and blue infrastructure:

- Urban parks support a variety of vegetation and animal life (e.g. birds)
- Wetlands contain species that maintain functioning of that ecosystem



Source: http://ec.europa.eu/environment/integration/research/newsalert/pdf/ecosystem_services_biodiversity_IR11_en.pdf

Biodiversity can be considered a feature of green infrastructure or an asset in its own right

Function	Description	Example
Biodiversity as a supporting function	Biodiversity is a feature of natural assets which supports their **ability** and **resilience** to provide ecosystem services	Enhances and improves sustainability of services e.g. pollination
Biodiversity as a city asset	Biodiversity is a type of natural asset which provides ecosystem services	Aesthetic enjoyment Connection to nature Health and wellbeing

Urban policies for biodiversity conservation tend to be limited to high-level goals

City	Baseline data	Biodiversity goals	Biodiversity targets	Biodiversity benefits as policy basis	Ecosystem services integration	Commit to Implementation (funds)	Regulatory elements	Monitoring elements
New York								
London								
Johannesburg								
Chicago								
Cape Town								
Vancouver								
Hong Kong								

Criteria met in full

Criteria not met

Natural capital accounting expands the set of assets valued in an economy

Natural assets (or natural capital) are classes of asset typically not included in economic accounts.

Globally there a significant amount of work on accounting methodologies to incorporate natural assets in national accounts e.g. System of Environment-Economic Accounting (SEEA), Wealth Accounting and the Valuation Ecosystem Services (WAVES).

Cities are increasingly using natural capital accounting as a tool to assess and monitor the quality of their environment and make better decisions.

- Incorporation of natural assets prominent in cities
- Quantification of services crucial for liveable cities, such as health.
- Initial thinking about integration of biodiversity

Source: Defra/ONS (2017)

Building a natural capital account

Steps in natural capital accounting	Assessment	Information and tools required
STEP 1: Extent and condition of natural assets	How much of the asset is there? What is the condition of the asset?	Location and extent of greenspaces, tree cover and vegetation
+		
STEP 2: Services provided in physical units	What services does the asset provide?	Census data, usage data, population health
+		
STEP 3: Value of ecosystem services	How much do people value these services?	Local census data, healthcare costs, tourism values

Source: Vivid Economics and ONS/Defra (2017)

London's natural capital account illustrates the value of multiple ecosystem services provided by urban greenspaces

Services provided by natural assets	Public services (£ billions)	Residents (£ billions)	Business (£ billions)	Total (£ billions)	Share (%)
Recreation		17		17	19
Mental health	1	3	2	7	7
Physical health	2	5	3	11	12
Amenity		56		56	61
Carbon (soil)				<1	1
Carbon (trees)				<1	<1
Temperature		1		1	1
Gross asset value	3	82	5	91	100
	4%	90%	6%	100%	

Source: London Parks Report

Natural capital accounting can support a variety of policy decisions

Policy decision	Use	Policy question	Analysis
Priorities and issues	Show current situation and future scenarios to identify issues	Status of natural assets and biodiversity	Interpretation of physical and monetary accounts past and present
Response and implementation	Supports assessment and design of policy	Economic, social and environmental benefits and costs of policy	Ex-ante assessment of costs and impacts
Monitoring, evaluation and adaptation	Track progress and monitor policies	Are policies meeting goals and target outcomes?	Assessment of policy progress over time against indicators

Managing assets and investments in green infrastructure based on outcomes could improve policy effectiveness

Cities can use the evidence base built up in natural capital accounts to build policies around green infrastructure management to take a:

- **Targeted approach:** Protect and enhance specific assets that contribute to specific policy objectives e.g. parks for health outcomes related to physical activity..

- **Integrated approach:** Better integration with urban planning by comparing benefits and costs of natural solutions with traditional solutions or alternative policies.

Integration with biodiversity policies could also be improved by:

- Linking metrics of biodiversity with provision and quality of ecosystem services provided by green infrastructure
- Inclusion of biodiversity metrics in physical accounts to track progress over time

Conclusion

Cities often provide infrastructure and services that provides public benefits, but green infrastructure is often not considered as a vital service

Focus on natural assets emphasises the services and economic value green and blue infrastructure provides

Biodiversity underpins the services provided by many natural assets and can also be seen as an asset by itself

Natural capital accounting can help cities assess benefits of green and blue infrastructure in a financial framework consistent with other public infrastructure.

Biodiversity assessments could be integrated into accounts by linking biodiversity to specific services or by inclusion of indices in physical accounts.

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