Hvilken rolle spiller jorden i byer for byens sundhed

- bredt forstået

- og hvorfor er der kommet mere fokus på den nu?

Claus Beier
Institut for Geovidenskab og
Naturforvaltning, Københavns Universitet

KØBENHAVNS UNIVERSITET

Life on Earth depends on healthy soils

EU's Soil mission

Sundhed i byen - bredt forstået

byen fungerer som en organisme eller økosystem

- interne processer og fluxe
- intern interaktion mellem individer og elementer
- interaktion med omgivelserne

Sundhed handler derfor om

klassisk sundhed for byens indbyggere (individuelt og socialt)

OG om

sunde funktioner og delsystemer (vand, kulstof, grønne områder mm.)

sundt samspil med omgivelserne (klima, biodiversitet, forbrug mm)

Jord

Er byens jord overhovedet jord
Er den interessant

?

Jord


- fundamentet for "liv"
- byens fundament og grønne liv
Jord = sundhed
Antropogenicitet
Natur
Skovbrug
Landbrug
Byer

Urbane GI - byens grønne liv

Ecosystem services

A typology for urban Green Infrastructure to guide multifunctional planning of nature-based solutions

Laurence Jones [a,k,*], Sally Anderson [b], Jeppe Læssøe [c], Ellen Banzhaf [d], Anne Jensen [e],

Parker & haver

"Restricted" grønne infrastrukturer

Lineære bio-korridorer

Konstruerede grønne infrastrukturer

Grønne infrastrukturer for vand

Blå infrastrukturer

Ecosystem Services (udtryk for "sundhed")

			Mad	Luft	Støj	Hede	Vand		C	Fys akt.	Soc akt.	Sundh & tress	Biodiv
			Food provision	Air pollution removal	Noise mitigation	Heat mitigation	Water quality mitigation	Water flow management	Maintaining carbon stocks	physical activity	social interactions	and cognitive restoration	Supporting biodiversity
		Shared common garden area	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Low	High	Low
		Shared common garden area	Medium	Low	Low	Medium	Medium	Medium	Low	Very high	Medium	Very high	High
		Shared common garden area	Medium	Low	Low	Medium	Medium	Medium	Low	Medium	High	Medium	Low
Mainly public space, but some access restrictions may apply	Parks	Pocket park	Low	Low	Low	Low	High	Medium	Low	Medium	Very high	High	Medium
		Park	Low	High	High	High	High	Medium	High	Very high	Very high	Very high	High
		Botanical garden	Low	High	Very high	Very high	High	Medium	High	Medium	High	Very high	Very high
		Heritage garden	Medium	Medium	High	High	High	Medium	Medium	Medium	High	Very high	High
		Nursery garden	Medium	Medium	Low	Low	High	Medium	Medium	Low	Medium	Medium	Low
Areas designed primarily for specific amenity uses	Amenity areas	Sports field	Negligible	Low	Low	Low	Low	Low	Low	Very high	High	Medium	Negligible
		School yard	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Very high	Very high	Medium	Negligible
		Playground	Negligible	Negligible	Negligible	Negligible	Low	Low	Negligible	Very high	Very high	Medium	Negligible
		Golf course	Negligible	Medium	Low	Low	Negligible	Medium	Low	Medium	High	High	Medium
		Shared open space (e.g. square)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Medium	Very high	Low	Negligible
Areas designed primarily for specific uses (not leisure); some access restrictions may	Other public space	Cemetery	Negligible	Medium	Medium	Medium	Medium	Medium	High	Low	Low	Very high	High
		Allotment/other growing space	Very high	Medium	Low	Low	Negligible	Medium	Negligible	High	High	Very high	High
		City farm	Very high	Medium	Low	Low	Negligible	Medium	Negligible	Medium	Medium	High	Medium
		Adopted public space	Low	Medium	Low	Low	Low	Low	Negligible	Negligible	Low	Medium	Low
Linked to routeways, geographical features and boundaries	Linear features/routes	Street tree	Low	High	Low	High	Low	Low	Medium	Negligible	Low	High	Medium
		Cycle track (as green/blue corridor)	Low	Low	Low	Low	Low	Low	Low	Very high	Medium	High	Low
		Footpath (as green/blue corridor)	Low	Low	Low	Low	Low	Low	Low	Very high	Very high	High	Low
		Road verge	Low	Low	Low	Low	Medium	Medium	Low	Negligible	Negligible	Low	Low
		Railway corridor	Negligible	Very high	Very high	Very high	Low	Medium	High	Negligible	Negligible	Low	Very high
		Riparian woodland	Low	Very high	Very high	Very high	Very high	High	Very high	High	High	Very high	Very high
		Hedge	Low	Medium	Low	Low	High	High	Medium	Negligible	Negligible	Medium	Medium
Constructed green and blue space, added to infrastructure	Constructed GI on infrastructure	Green roof	Negligible	Low	Negligible	Low	Low	High	Low	Negligible	Negligible	Low	Low
		Green wall	Negligible	Medium	Medium	Low	Negligible	Low	Low	Negligible	Negligible	Medium	Low
		Roof garden	Medium	Medium	Low	Medium	Low	Low	Medium	Low	High	Very high	Medium
		Pergola (with vegetation)	Negligible	Medium	Low	High	Low	Low	Medium	Negligible	Low	High	Low
Infrastructure designed to incorporate some GBS components	Hybrid GI (for water)	Permeable paving	Negligible	Negligible	Negligible	Negligible	High	High	Negligible	Low	Negligible	Negligible	Negligible
		Permeable parking/roadway	Negligible	Negligible	Negligible	Negligible	High	High	Low	Negligible	Negligible	Negligible	Negligible
		Attenuation pond	Negligible	Low	Low	Low	Very high	Very high	Medium	Negligible	Low	Medium	High
		Flood control channel	Negligible	Low	Negligible	Low	Low	Very high	Low	Negligible	Low	Negligible	Medium
		Rain garden	Low	Medium	Negligible	Low	High	High	Medium	Negligible	Negligible	High	Medium
		Bioswale	Negligible	Medium	Low	Low	Medium	Very high	Medium	Negligible	Negligible	Low	Medium
Bluespace features	Waterbodies	Wetland	Negligible	Medium	Low	Medium	Very high	Very high	Medium	Low	Medium	Very high	High
		River/stream	Low	Low	High	High	Medium	High	Low	Medium	High	Very high	High
		Canal	Low	Low	Low	Medium	Low	Medium	Low	Medium	High	Very high	Low
		Pond	Negligible	Low	Low	Low	Low	High	Medium	Low	High	Very high	High
		Lake	Medium	Low	Medium	High	High	High	Medium	High	High	Very high	Very high
		Reservoir	Low	Low	Medium	High	High	Very high	Medium	High	High	Very high	Medium
		Estuary/tidal river	High	Low	High	High	High	N/A	Medium	Medium	High	Very high	Very high
		Sea (incl. coast)	High	Low	High	Very high	High	N/A	Very high	Very high	Very high	Very high	Very high
Other un-sealed features without specified use, often on private land	Other non-sealed urban areas	Woodland (other)	Low	Very high	Very high	Very high	High	High	Very high	High	High	Very high	Very high
		Grass (other)	Low	Low	Low	Low	Medium	Medium	Low	Very high	High	Medium	Medium
		Shrubland (other)	Low	Medium	Low	Low	High	High	Medium	Medium	Medium	High	High
		Arable agriculture	Very high	Medium	Low	Low	Low	Low	Low	Low	Low	Low	Low
		Sparsely vegetated land	Negligible	Negligible	Low	Low	Low	Low	Low	Low	Low	Low	Low

… næsten alle er relateret til jord

Jones et al., Nature Based Solutions, 2022

Fig. 1. Assessment matrix of GI types and ecosystem services delivered.

Økosystem tjenester i byen

Næsten alle relateret til byens jord

>50% af verdens befolkning lever i byen
– for mange er byens ES dét de får

Kloden ”brænder” – byerne vokser

Hvis byen ikke leverer ”sundhed”

(GI, kulstof, klima, biodiversitet, vand, energi, sundhed ….)

påvirker det indbyggerne og omgivelserne

Så, hvis vi opgiver at byens jord betyder noget mister vi ”sundhed”, andre skal gøre mere og vi opgiver at gøre os umage

?

…. så ja

byens jord betyder noget
den er afgørende for et stort antal parametre
i byernes liveability - i borgernes livskvalitet
i byens funktion - i verdens funktion

Mere end ”det der er tilbage når byen er bygget”

OK – byens jord er vigtig

Hvad sker i praksis
- før og nu

Jord er under pres

Så længe der var plads nok
var det ikke et problem
… men pladsen ER blevet et problem!

Natur | Skovbrug | Landbrug | Byer

Antropogenicitet

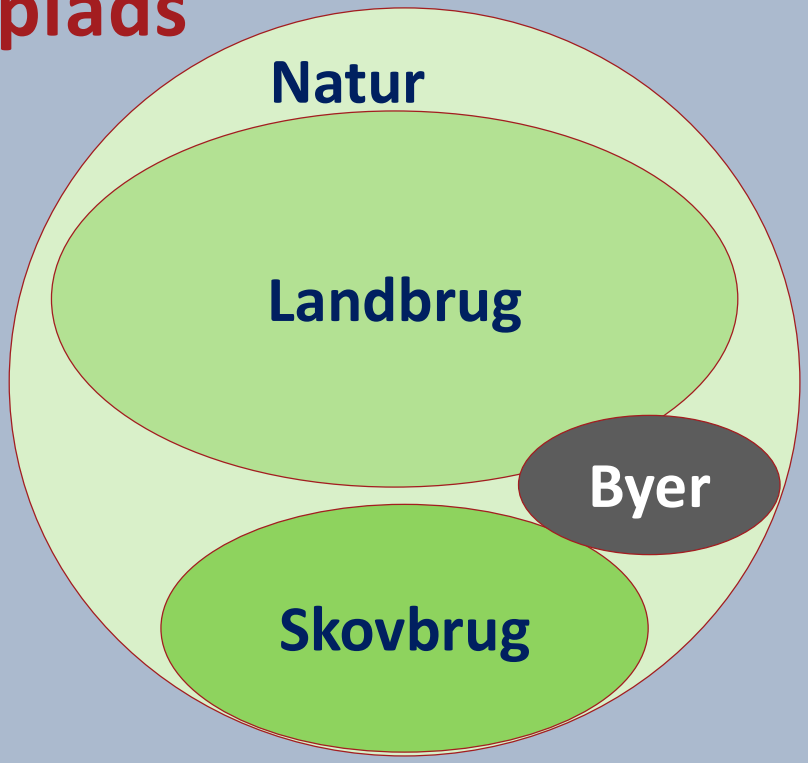
Flere mennesker i byen kræver mere plads

… i OG udenfor byen

… mindre jord

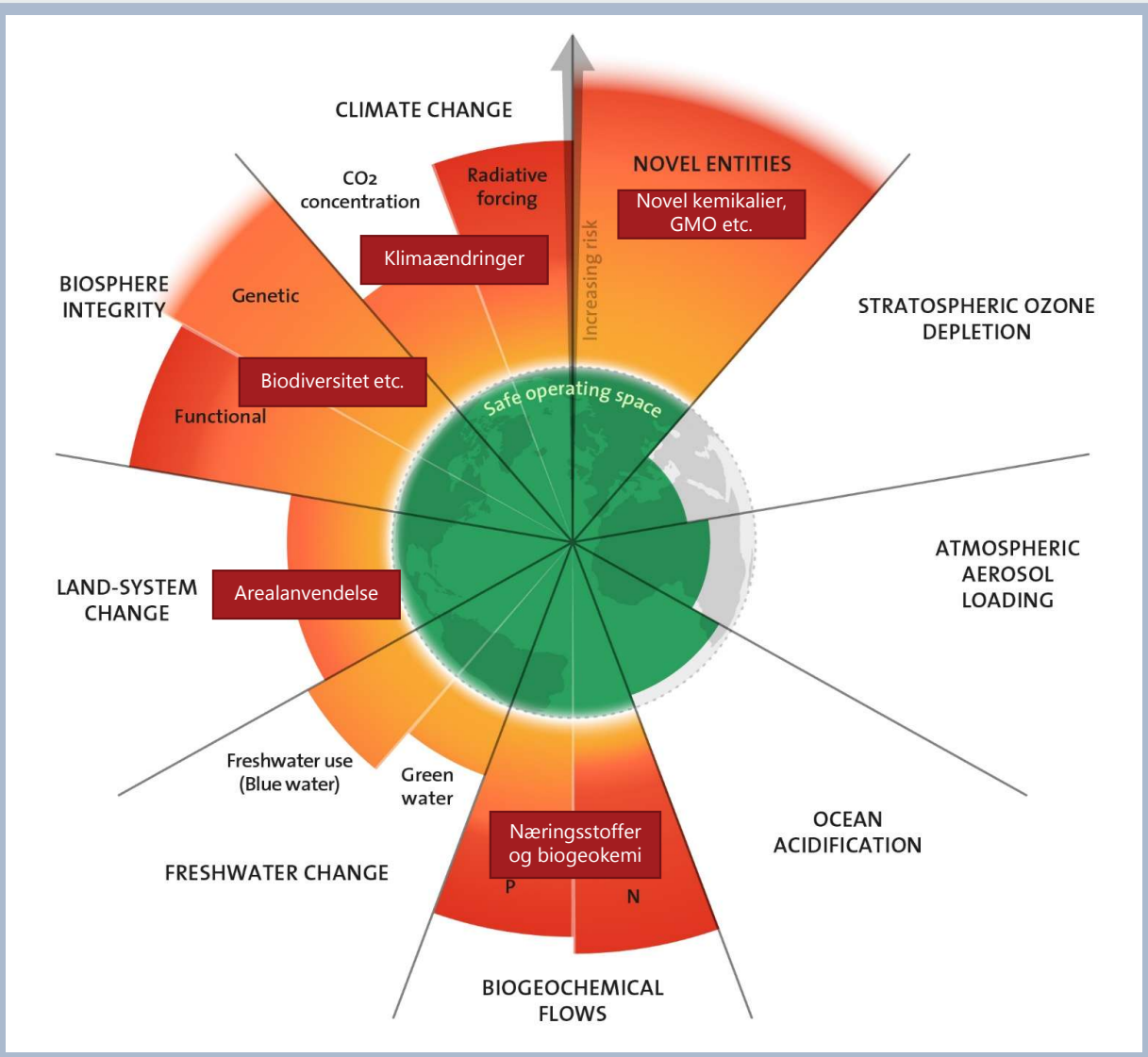
57% af verdens befolkning,
75% af ressourceforbruget,
80% af GDP knyttes til byer

"Land take" for infrastructure in EU-UK 2012-2018: c. 3600 km^2



Direkte	Areal	Indirekte
Infrastruktur		Mad, energi, materialer
Mad, energi, materialer		Klima
GI og rekreation		Biodiversitet

Antropogenicitet



Planetære grænser

For næsten alle overskredne planetære grænser spiller jord en vigtig rolle!!

Derfor er der øget fokus på jords sundhed

Generelt OG i byen

Politik, forskning, administration

Jords sundhed – et eksempel

EU's Soil Mission – også jord i byer

Life on Earth depends on healthy soils.

Økosystem services fra jord inkuderer:

- Sikre fødevarer – og sunde fødevarer
- Lagring, rensning, storm-regulering og gendannelse af vand
- Kulstof-fangst og lagring
- Næringsstof-circulation
- Reducere kontaminering
- Beskyt biodiversitet og habitater
- Støt landskabers kvalitet
- Beskyt kulturarv
- Sikring af grønne byer

EU Soil mission

Omkostninger relateret til soil degradation i EU > 50 mia€/yr

… og det handler ikke bare om naturvidenskab

EU Soil mission

8 specific objectives (Criteria)
6 natural science

4 operational objectives

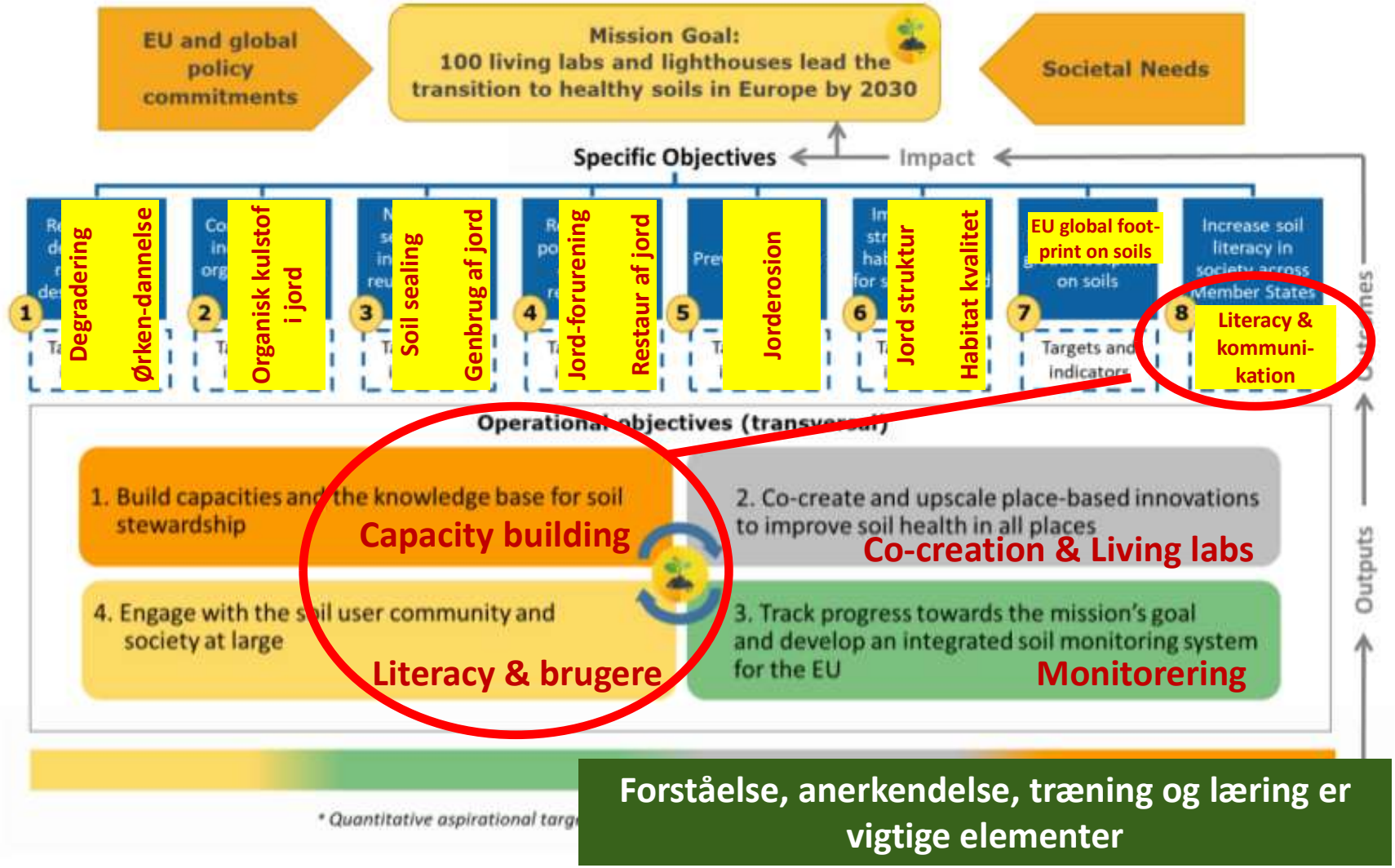


Figure 2. Schematic view of the mission's intervention logic

OK, så vi ved jorden er vigtig, også i byen .. men..

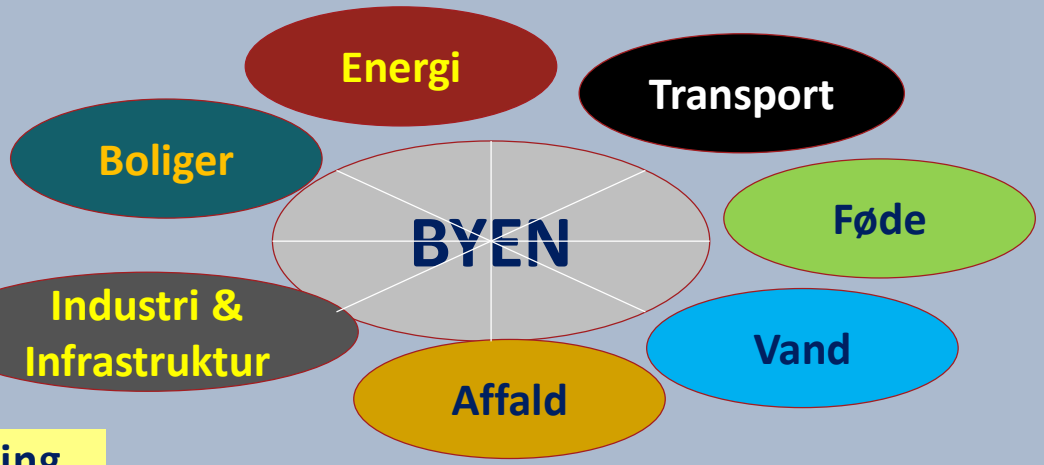
Når byen rykker ind ryger jorden ”ud”

Overdækning – biologisk og hydrologisk obstruktion, ingen kulstofbinding
Forurening – ødelagt mikrobiel funktion, giftighed for vand, planter og mennesker
Koncentration & reduceret jordareal – mindre jord til mere vand og biologi
Ødelagt jordstruktur – compaction, erstatning af jord med ikke-jord

Mindre biologi, mindre grønt, mindre hydrologi
mere varme, mere luftforurening, mindre sundhed

Det urbane dilemma – afkobling/dys-funktion

Essentielle behov
Fysisk fundering & infrastruktur
Tech- & institional Space
Impermeable overflader
Import af forbrug



Matrikulering

Konsekvens
Biol. & hydrol. dysfunktion
Jord-, vand- & luft-forurening
Tab af ”globalt” perspektiv

Støj – Luftforurening
Oversvømmelse
Hedebølger
Natur-afkobling
Klimaændringer - stress
asocialitet

”Ussentielle” behov
Blå/grønne områder
Social & rekreativ udfold
Liveable city

Urban ”natur”

Liveable cities

Hvad er ”liveability”?

For den enkelte (grønne områder og (lav)praktisk/social service)

Sort | **Grå** | **Grønne (og blå) infrastruktur** | **- og brune**

Liveability er også det fælles (biodiversitet, klima mm.)
Byen har et medansvar!!

Jorden er en afgørende faktor

Integrere og koble løsninger for den enkelte og os alle

Hvad kan vi så gøre

Er jords sundhed relevant og vigtigt i praksis

Soil Health er et relevant koncept for urbane jorde

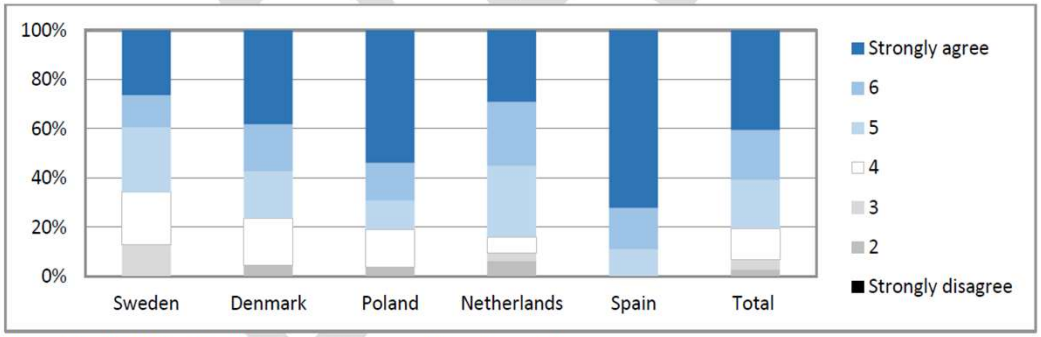


Figure CC-Q13aU. "Soil health is a relevant concept for urban soils"

Resultat af PrepSoil survey blandt praktikere

Mål for og kortlægning af urbane GI & ES

A typology for urban [illegible]rastructure to guide multifunctional planning of nature-bas[illegible]ons

Laurence Jones [a,k,*], Sally A[illegible], Philippe Læssøe [c], Ellen Banzhaf [d], Anne Jensen [e], David

Parker & haver

"Restricted" grønne infrastrukturer

Lineære bio-korridorer

Konstruerede grønne infrastrukturer

[illegible]rønne infrastrukturer for vand

Ødelagte eller manglende økosystem tjenester koster!!

			Ecosystem Services										
			Mad	Air	Støj	Hede	Vand		C	Fys akt.	Soc akt.	Sundh & tress	Biodiv
Brief description	Object type	Object category	Food provision	Air pollution removal	Noise mitigation	Heat mitigation	Water quality mitigation	Water flow management	Maintaining carbon stocks	physical activity	social interactions	and cognitive restoration	Supporting biodiversity
Mainly private space linked to dwellings	Gardens	Balcony	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Low	High	Low
		Private garden	Medium	Low	Low	Medium	Medium	Medium	Low	Very high	Medium	Very high	High
		Shared common garden area	Medium	Low	Low	Medium	Medium	Medium	Low	Medium	High	Medium	Low
Mainly public space, but some access restrictions may apply	Parks	Pocket park	Low	Low	Low	Low	High	Medium	Low	Medium	Very high	High	Medium
		Park	Low	High	High	High	High	Medium	High	Very high	Very high	Very high	High
		Botanical garden	Low	High	Very high	Very high	High	Medium	High	Medium	High	Very high	Very high
		Heritage garden	Medium	Medium	High	High	High	Medium	Medium	Medium	High	Very high	High
		Nursery garden	Medium	Medium	Low	Low	High	Medium	Medium	Low	Medium	Medium	Low
Areas designed primarily for specific amenity uses	Amenity areas	Sports field	Negligible	Low	Low	Low	Low	Low	Low	Very high	High	Medium	Negligible
		School yard	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Very high	Very high	Medium	Negligible
		Playground	Negligible	Negligible	Negligible	Negligible	Low	Low	Negligible	Very high	Very high	Medium	Negligible
		Golf course	Negligible	Medium	Low	Low	Negligible	Medium	Low	Medium	High	High	Medium
		Shared open space (e.g. square)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Medium	Very high	Low	Negligible
Areas designed primarily for specific uses (not leisure); some access restrictions may	Other public space	Cemetery	Negligible	Medium	Medium	Medium	Medium	Medium	High	Low	Low	Very high	High
		Allotment/other growing space	Very high	Medium	Low	Low	Negligible	Medium	Negligible	High	High	Very high	High
		City farm	Very high	Medium	Low	Low	Negligible	Medium	Negligible	Medium	Medium	High	Medium
		Adopted public space	Low	Medium	Low	Low	Low	Low	Negligible	Negligible	Low	Medium	Low
Linked to routeways, geographical features and boundaries	Linear features/routes	Street tree	Low	High	Low	High	Low	Low	Medium	Negligible	Low	High	Medium
		Cycle track (as green/blue corridor)	Low	Low	Low	Low	Low	Low	Low	Very high	Medium	High	Low
		Footpath (as green/blue corridor)	Low	Low	Low	Low	Low	Low	Low	Very high	Very high	High	Low
		Road verge	Low	Low	Low	Low	Medium	Medium	Low	Negligible	Negligible	Low	Low
		Railway corridor	Negligible	Very high	Very high	Very high	Low	Medium	High	Negligible	Negligible	Low	Very high
		Riparian woodland	Low	Very high	Very high	Very high	Very high	High	Very high	High	High	Very high	Very high
		Hedge	Low	Medium	Low	Low	High	High	Medium	Negligible	Negligible	Medium	Medium
Constructed green and blue space, added to infrastructure	Constructed GI on infrastructure	Green roof	Negligible	Low	Negligible	Low	Low	High	Low	Negligible	Negligible	Low	Low
		Green wall	Negligible	Medium	Medium	Low	Negligible	Low	Low	Negligible	Negligible	Medium	Low
		Roof garden	Medium	Medium	Low	Medium	Low	Low	Medium	Low	High	Very high	Medium
		Pergola (with vegetation)	Negligible	Medium	Low	High	Low	Low	Medium	Negligible	Low	High	Low
Infrastructure designed to incorporate some GBS components	Hybrid GI (for water)	Permeable paving	Negligible	Negligible	Negligible	Negligible	High	High	Negligible	Low	Negligible	Negligible	Negligible
		Permeable parking/roadway	Negligible	Negligible	Negligible	Negligible	High	High	Low	Negligible	Negligible	Negligible	Negligible
		Attenuation pond	Negligible	Low	Low	Low	Very high	Very high	Medium	Negligible	Low	Medium	High
		Flood control channel	Negligible	Low	Negligible	Low	Low	Very high	Low	Negligible	Low	Negligible	Medium
		Rain garden	Low	Medium	Negligible	Low	High	High	Medium	Negligible	Negligible	High	Medium
		Bioswale	Negligible	Medium	Low	Low	Medium	Very high	Medium	Negligible	Negligible	Low	Medium
												Very high	High
												Very high	High
												Very high	Low
												Very high	High
												Very high	Very high
												Very high	Medium
												Very high	Very high
												Very high	Very high
												Very high	Very high
												Medium	Medium
												High	High
												Low	Low
		Sparsely vegetated land	Negligible	Negligible	Low	Negligible	Low	Low	Negligible	Medium	Medium	Medium	Low

Jones et al., Nature Based Solutions, 2022

Fig. 1. Assessment matrix of GI types and ecosystem services delivered.

1) Politisk målsætning – for byen OG helheden - gør det ussentielle værdifuldt

2) Kortlægning af status og muligheder

Et par konkrete eksempler

Intet mål og ingen plan for byens ussentielle behov
Her kunne jord godt være mere end det der blev tilbage

Fortunen 30/11-2025

Glasvej 30/11-2025

Løsninger for byens grønne, blå og brune elementer


Bynære vådområder


Permeable overflader


Byskov


Veje og infrastruktur


Blomsterbede


Oversvømmelses basiner


Køkkenhaver


Grønne tage & altaner

Offentlige og private græsplæner

Urbant landbrug

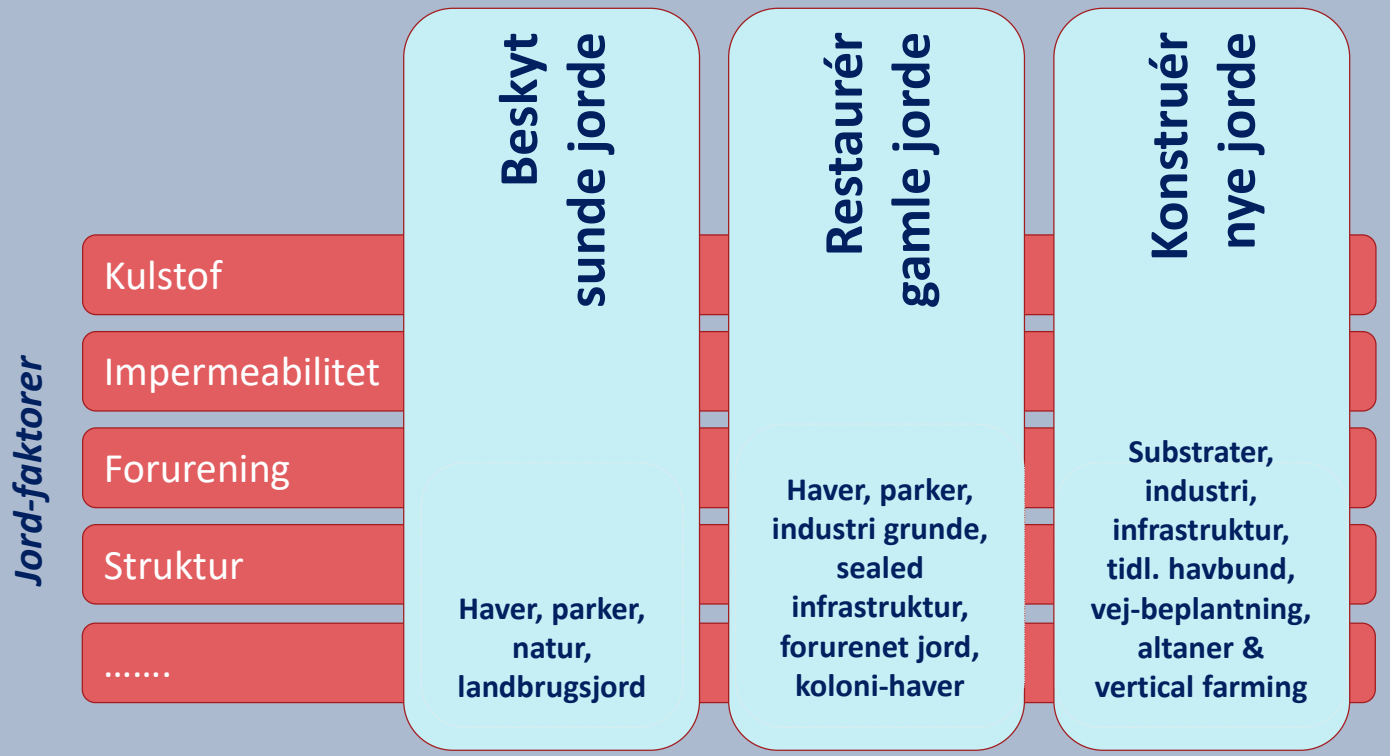
Kunstige substrater

Private haver

Nature based solutions - men ikke kun!!

3) Udvikle konkrete løsninger

3 strategier til sund jord



Beskyt, restaurér og konstruér

Sammenhænge mellem byens grønne/blå/brune områder

Byen er en helhed med mange lag og dimensioner - nærhed og forbindelser afgør service provision
Byens jorde handler ikke kun om den enkelte matrikel men om at skabe sammenhæng

Airsheds, watersheds and more – The flows that drive intra-extra-urban connections, and their implications for nature-based solutions (NBS)

Laurence Jones [a,o,*], Stefan Reis [b,h], Mike Hutchins [c], James Miller [c], Baihuiqian He [b],

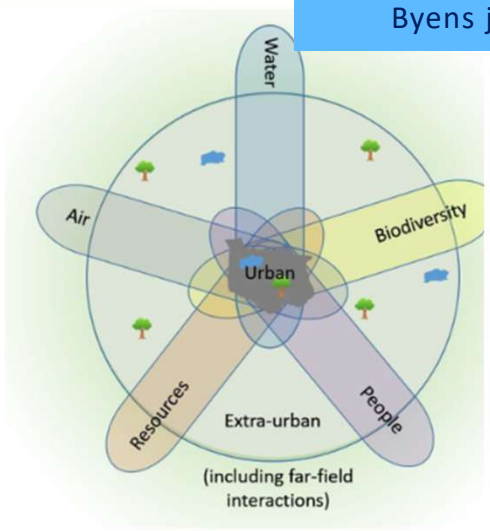
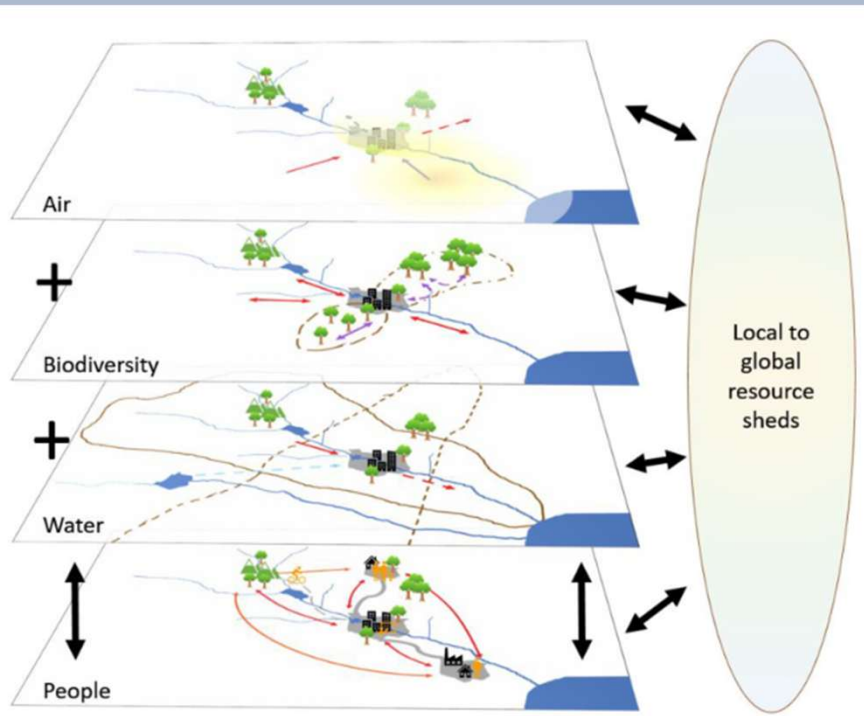


Fig. 1. 'Sheds' concept showing that urban areas interact with mu
mains, connected across scales.

Byer rummer intra- & extra-urbane Forbindelser på mange dimensioner



n cities. Panels

Jones et al., Nature Based Solutions, 2022

4) Skab sammenhænge i stedet for matrikler

Er jords sundhed relevant og vigtigt i praksis

Soil Health er et relevant koncept for urbane jorde

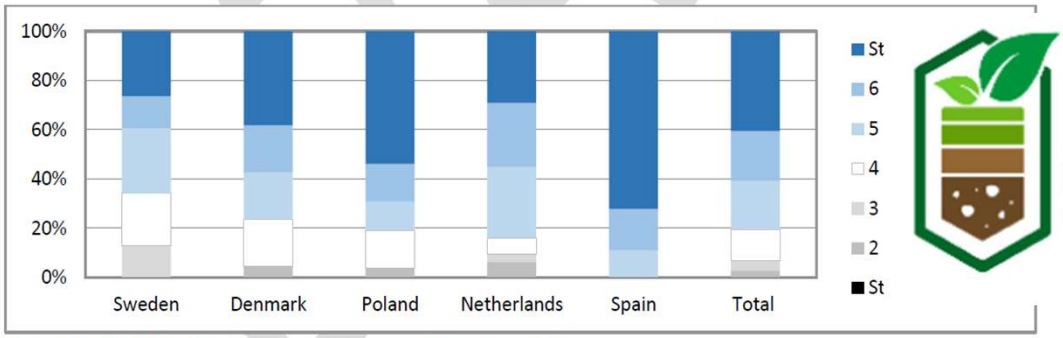


Figure CC-Q13aU. "Soil health is a relevant concept for urban soils"

Den urbane sektor bruger det som koncept?

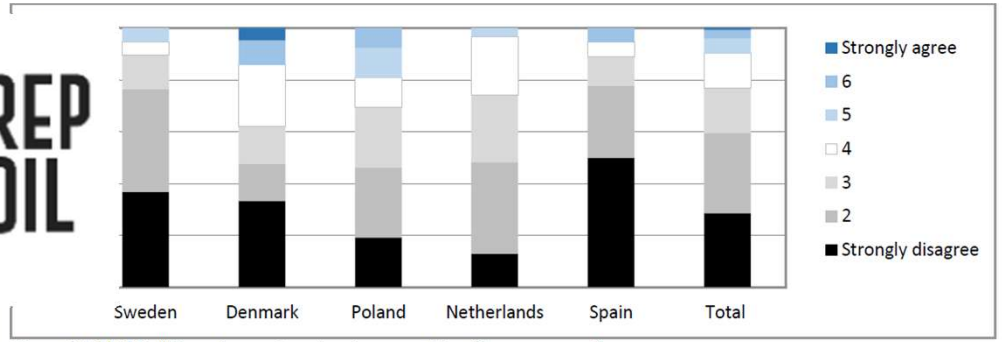


Figure CC-Q13bU. "The urban sector already uses soil health as a concept"

Resultat af PrepSoil survey blandt praktikere

5) Styrk literacy, kapacitetsbygning, uddannelse

Urbane jorde – vejen frem

1) Politisk målsætning – for byen OG for helheden - gør det ussentielle værdifuldt
2) Kortlægning af status og muligheder

3) Udvikle konkrete løsninger – beskyt, restaurer og konstruer

4) Skab sammenhænge i stedet for matrikler

5) Literacy, kapacitetsbygning, uddannelse

Tak for opmærksomheden – og god konference