

UC Sustentabilidade (1º Ciclo)












12 RESPONSIBLE CONSUMPTION AND PRODUCTION



T8.

David Avelar

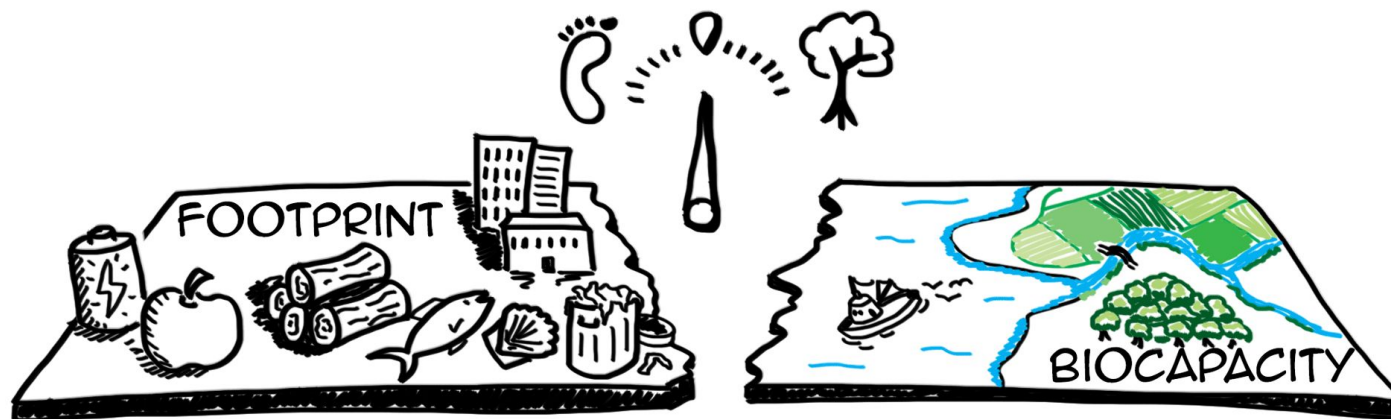
Produção e Consumo Sustentável

TARGET 12-1	TARGET 12-2	TARGET 12-3	TARGET 12-4	TARGET 12-5	TARGET 12-6	TARGET 12-7	TARGET 12-8	TARGET 12-A	TARGET 12-B	TARGET 12-C
										
IMPLEMENT THE 10-YEAR SUSTAINABLE CONSUMPTION AND PRODUCTION FRAMEWORK	SUSTAINABLE MANAGEMENT AND USE OF NATURAL RESOURCES	HALVE GLOBAL PER CAPITA FOOD WASTE	RESPONSIBLE MANAGEMENT OF CHEMICALS AND WASTE	SUBSTANTIALLY REDUCE WASTE GENERATION	ENCOURAGE COMPANIES TO ADOPT SUSTAINABLE PRACTICES AND SUSTAINABILITY REPORTING	PROMOTE SUSTAINABLE PUBLIC PROCUREMENT PRACTICES	PROMOTE UNIVERSAL UNDERSTANDING OF SUSTAINABLE LIFESTYLES	SUPPORT DEVELOPING COUNTRIES' SCIENTIFIC AND TECHNOLOGICAL CAPACITY FOR SUSTAINABLE CONSUMPTION AND PRODUCTION	DEVELOP AND IMPLEMENT TOOLS TO MONITOR SUSTAINABLE TOURISM	REMOVE MARKET DISTORTIONS THAT ENCOURAGE WASTEFUL CONSUMPTION



- Qual o teu Dia da Sobrecarga da Terra?
- Se todos vivessem como tu, quantos Planetas Terra seriam precisos?

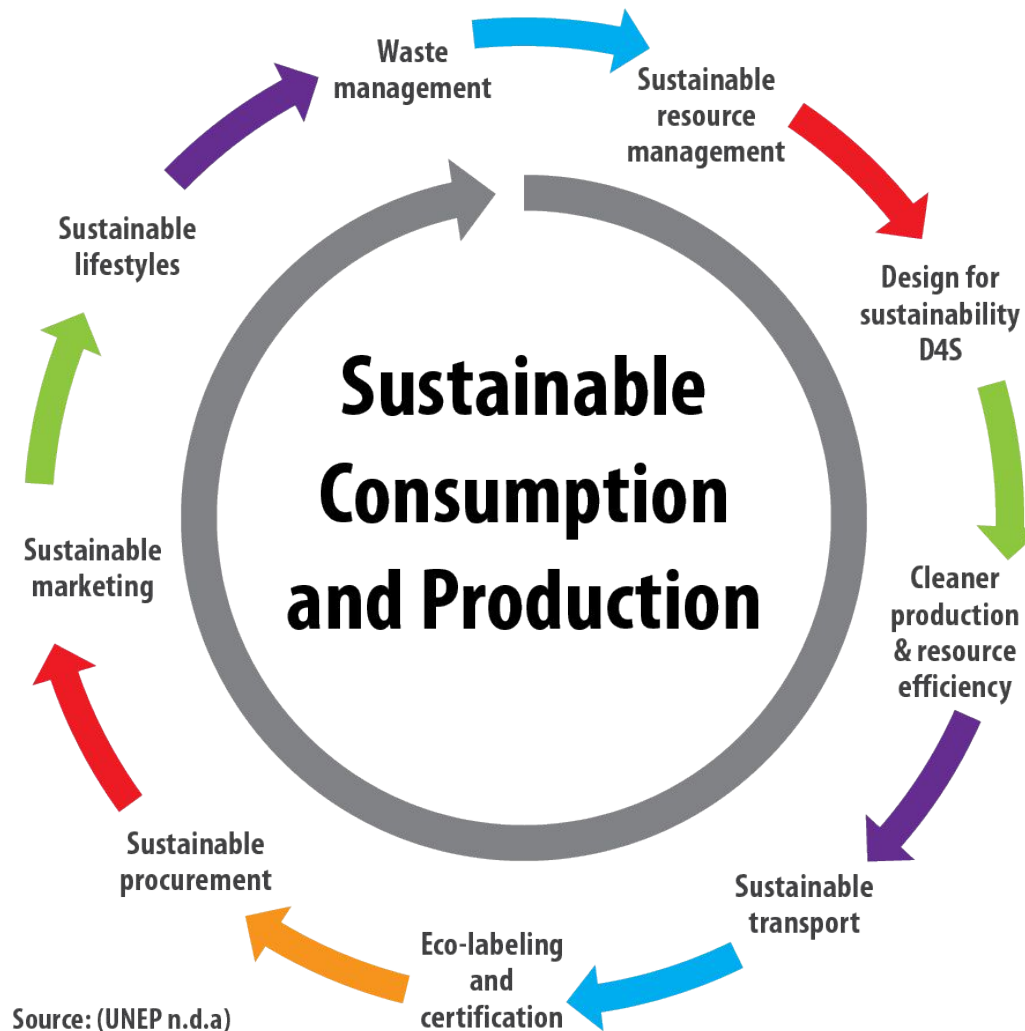
Pegada ecológica Vs Biocapacidade





- O que é Produção e Consumo Sustentável?

- Produção
- Consumo





- Que indicadores utilizar para monitorizar?

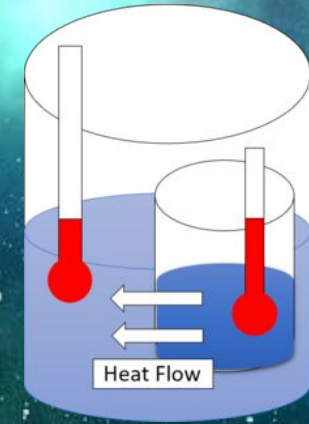
(ex.: www.odslocal.pt)





What is the **MEANING** of **LIFE**?



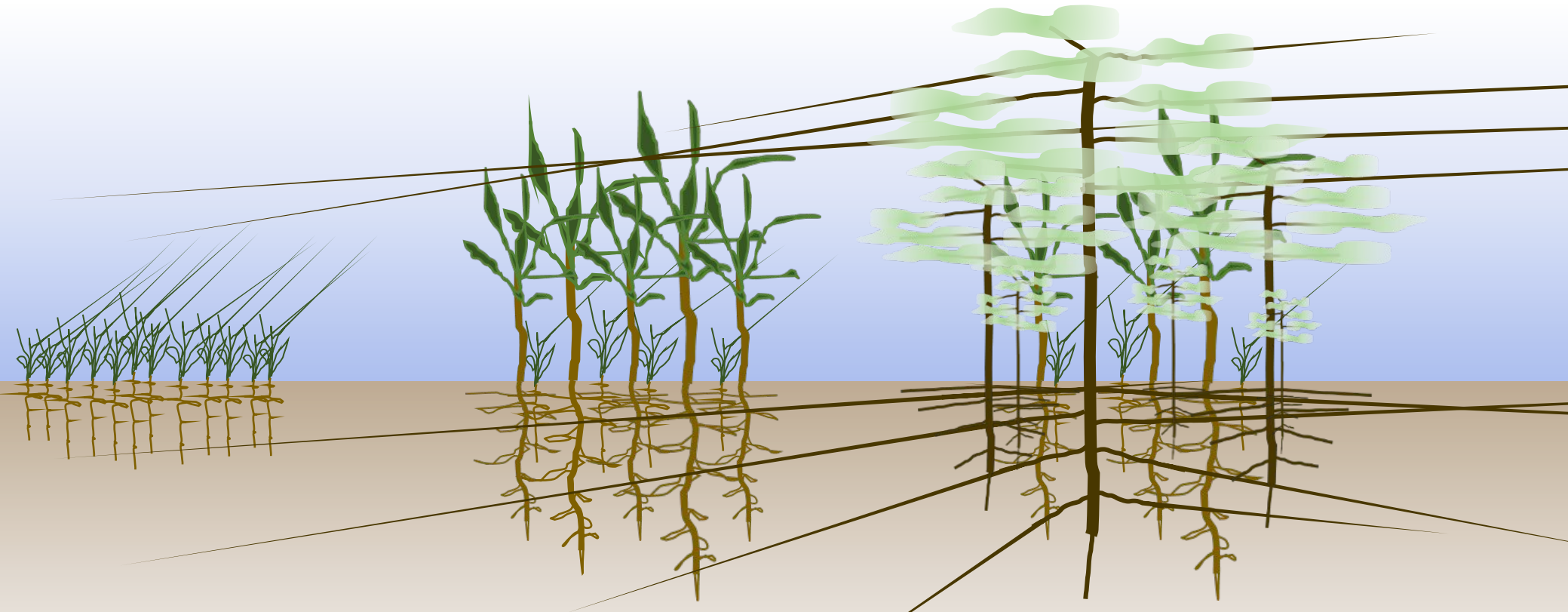


Maximizing disorder - The second law

Entropy

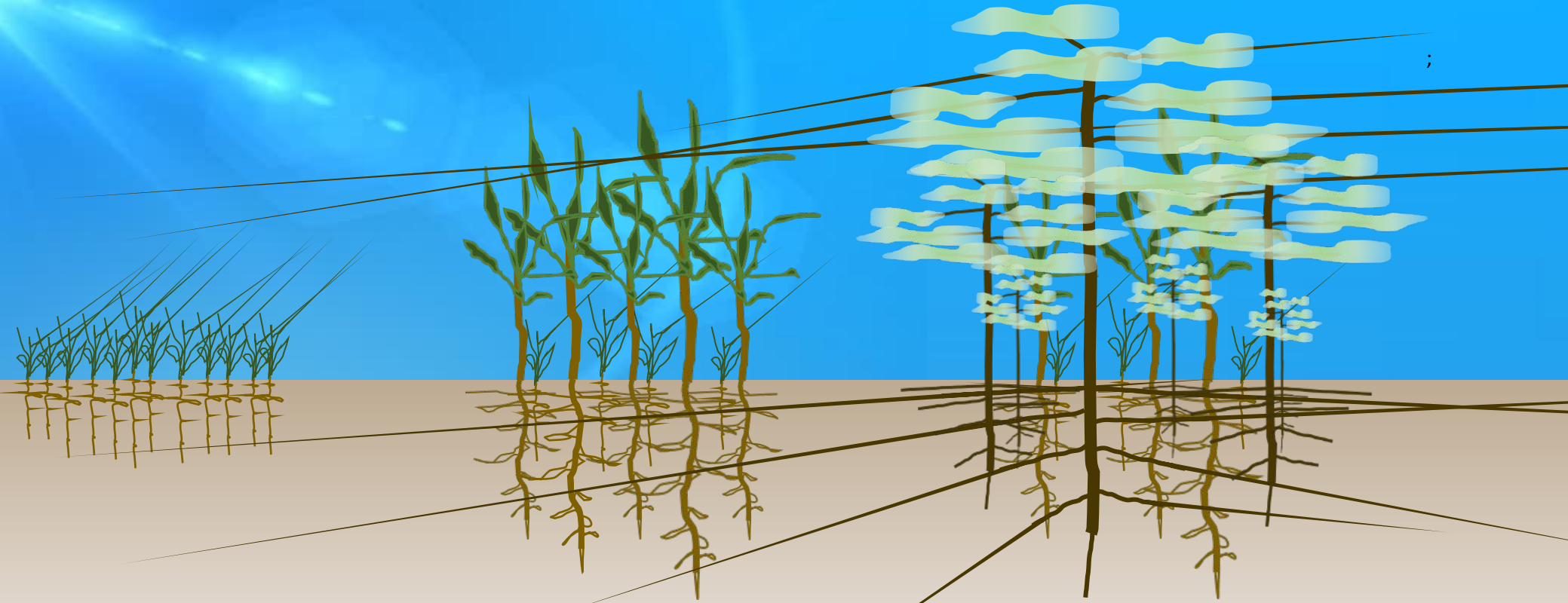


LIFE

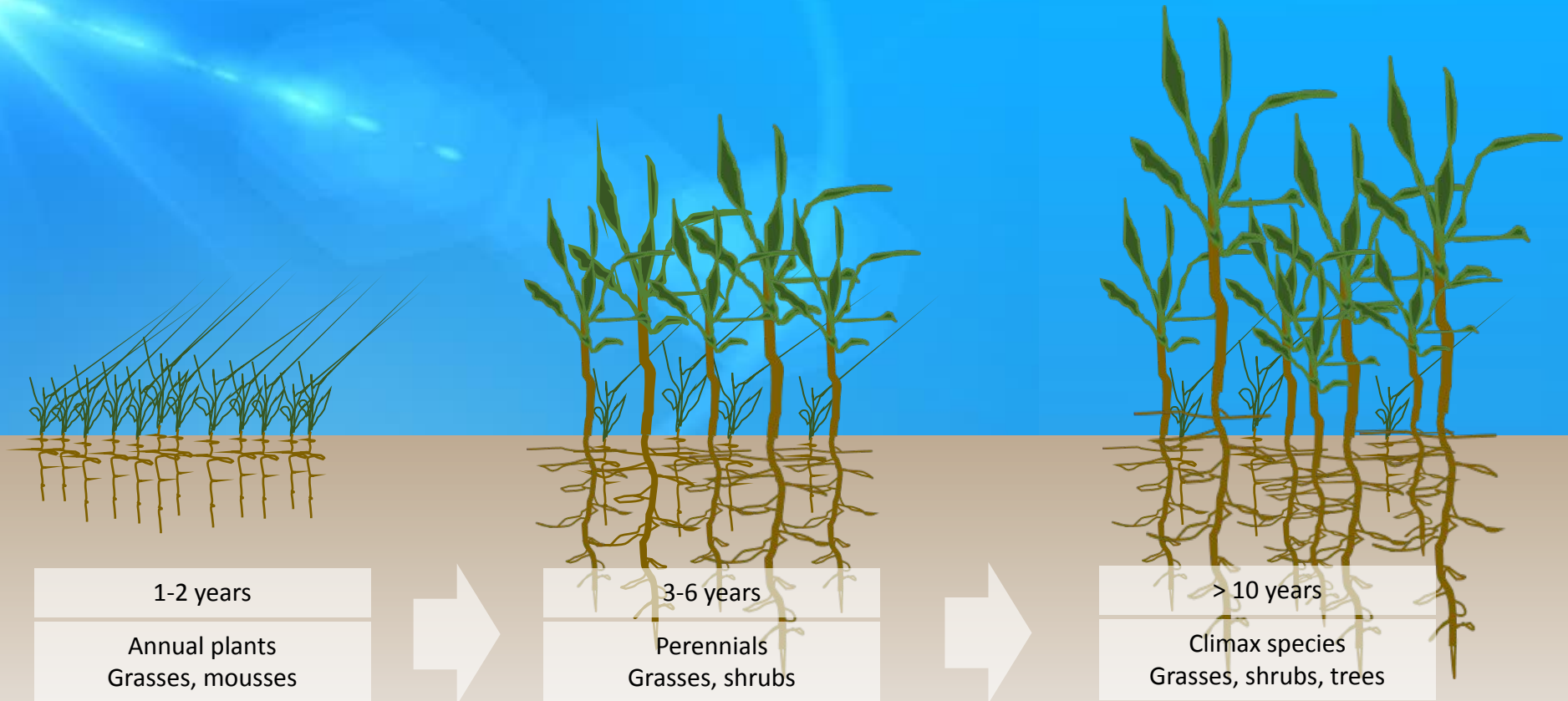


Entropy

SUN

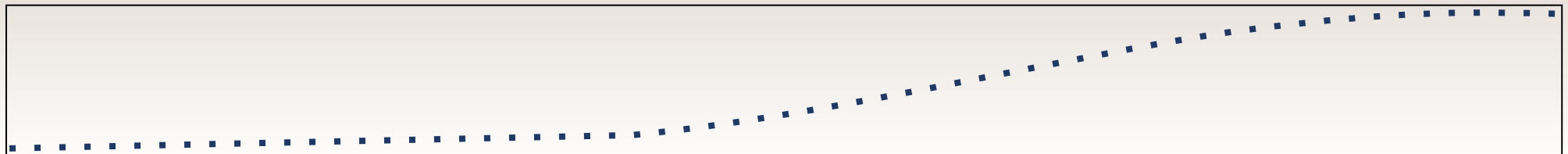


BIOMASS

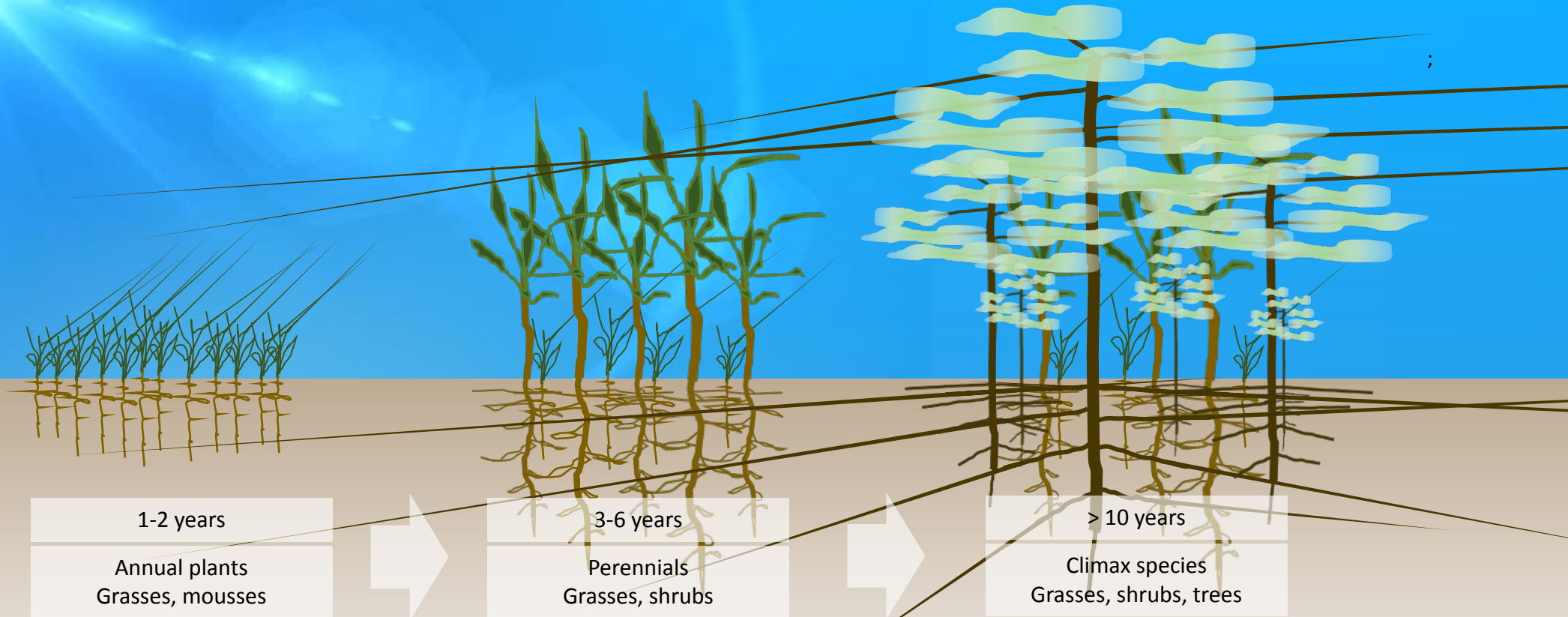


Eco-Exergy

Biomass

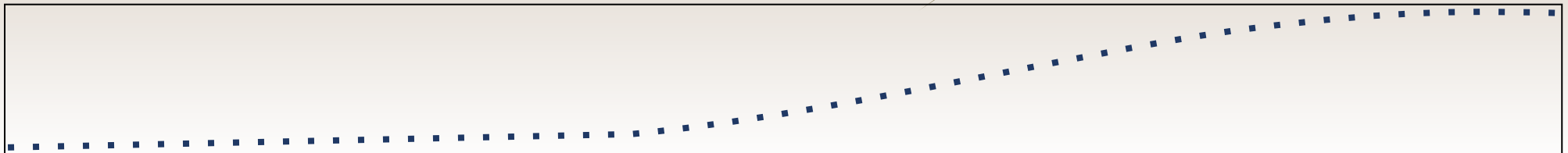


DIVERSITY

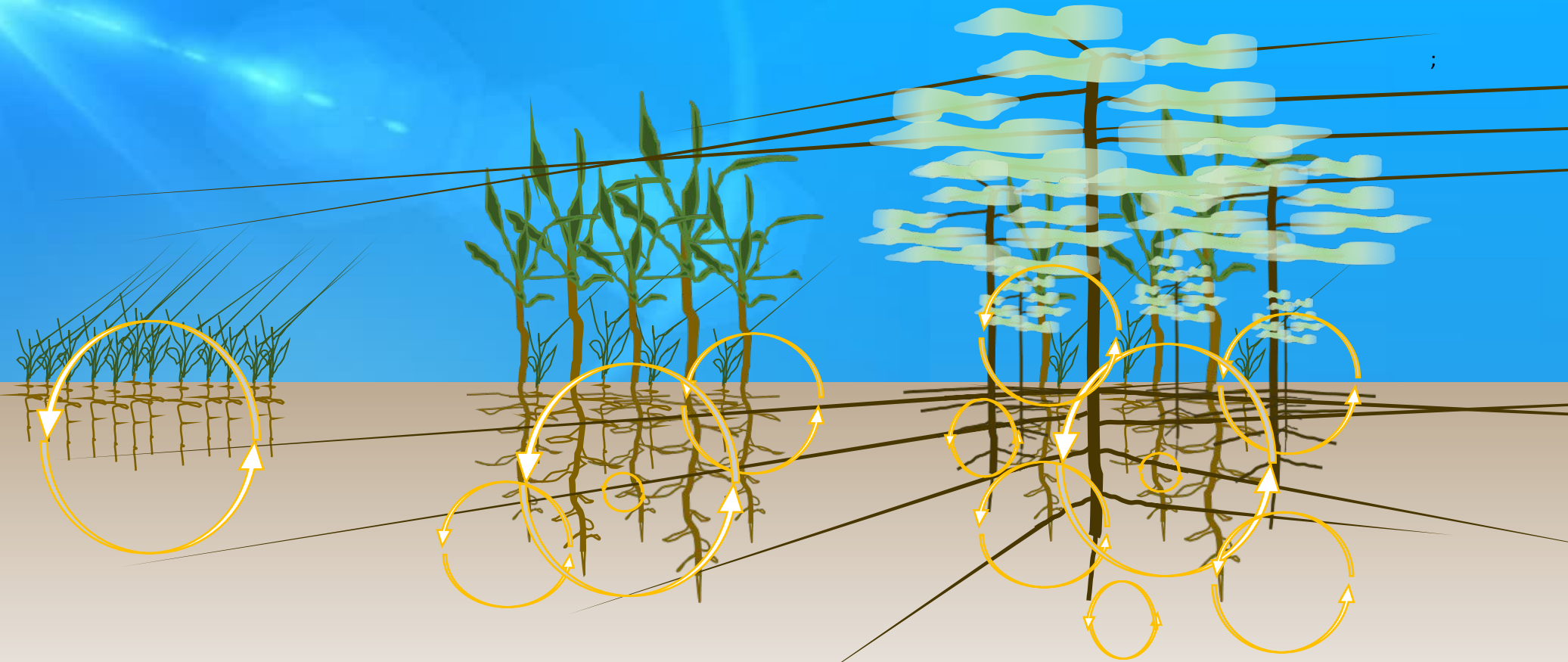


Eco-Exergy

Biomass
Diversity

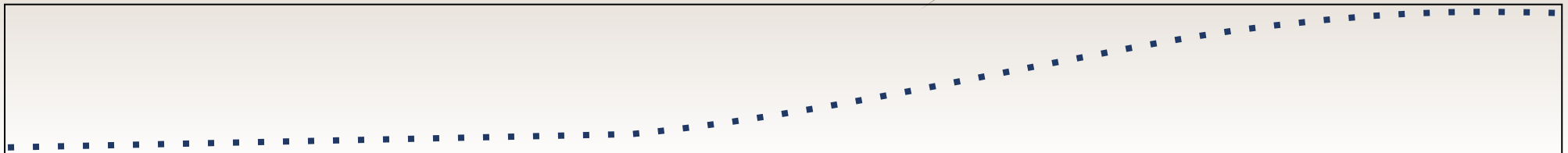


CONNECTIVITY



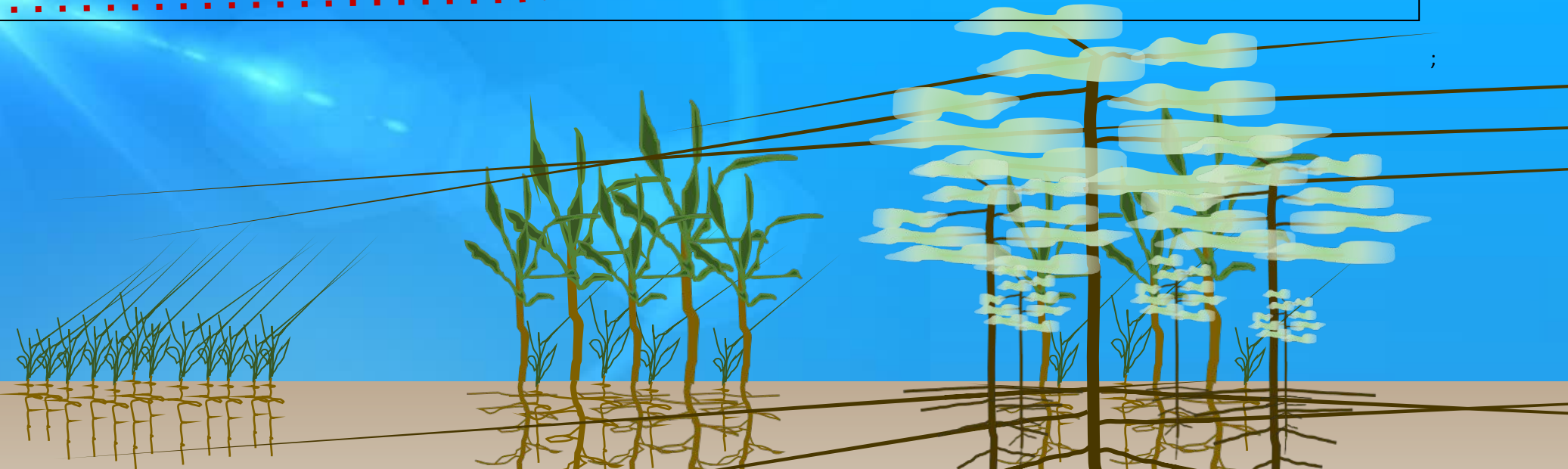
Eco-Exergy

Biomass
Diversity
Connectivity



LIFE increasing SOLAR entropy

Entropy



1-2 years
Annual plants
Grasses, mosses



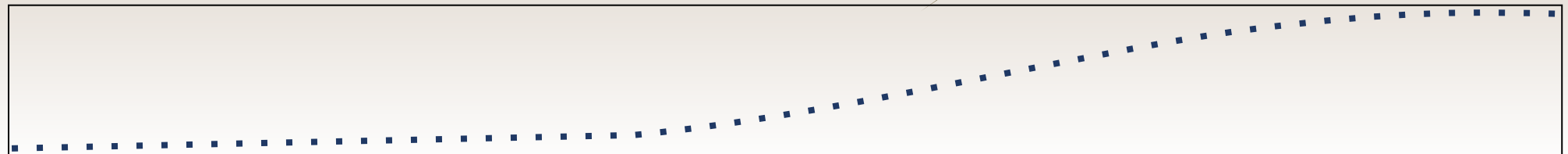
3-6 years
Perennials
Grasses, shrubs



> 10 years
Climax species
Grasses, shrubs, trees

Eco-Exergy


Biomass
Information
Network



Permaculture - Closing cycles



Design framework of human habitats that mimic natural patterns and relations



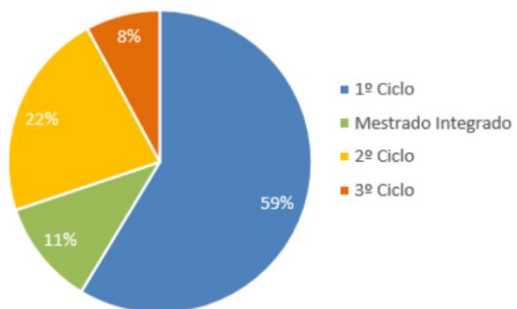
Faculdade de Ciências da Universidade de Lisboa

112 m

Google Earth

Faculdade de CIÊNCIAS

Inscritos 2019



5457

Recursos Humanos



Faculdade de Ciências da Universidade de Lisboa

Números:

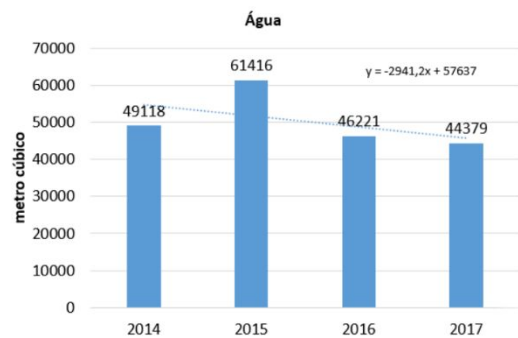
Área: 76 172 m²

Temperatura média: 16.9 °C

Pluviosidade média anual: 691 mm.

112 m

Faculdade de CIÊNCIAS



Irrigação = 13 000 m³/ano



Números:

Área: 76 172 m²

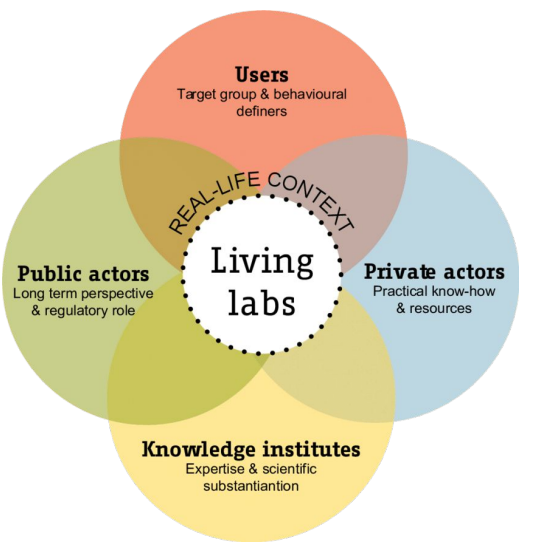
- verde: 22 425 m² (29%)
- impermeab.: 53 747 m² (71%)

Temperatura média: 16.9 °C

Pluviosidade média anual: 691 mm.

- total: 52 634 m³/ano
- imperm.: 37 239 m³/ano
- verde (RR + rega): 28 495 m³/ano

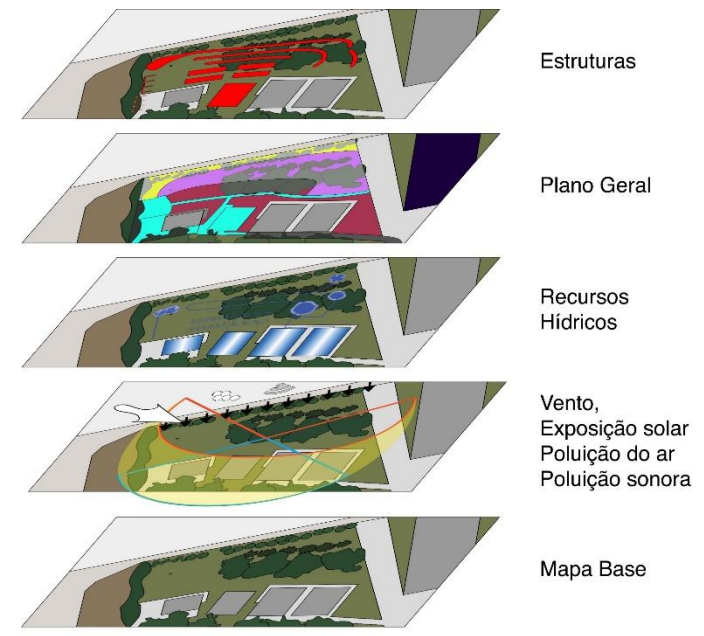
Living Laboratory



Faculdade de Ciências da Universidade de Lisboa

112 m

PermaLab



TARGET 12-2



**SUSTAINABLE
MANAGEMENT AND
USE OF NATURAL
RESOURCES**

Water Cycle

6 CLEAN WATER AND SANITATION

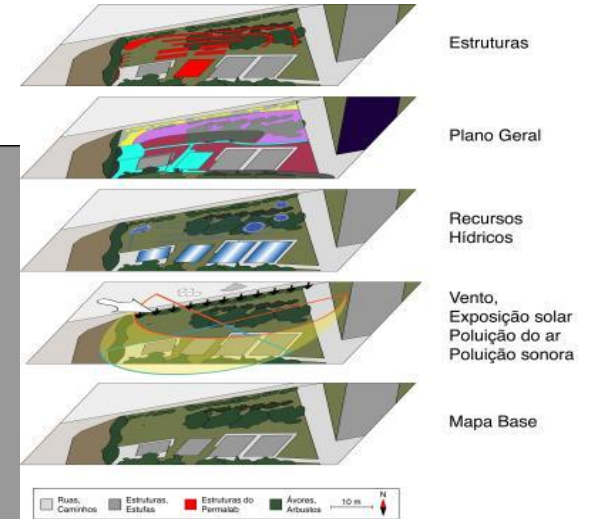
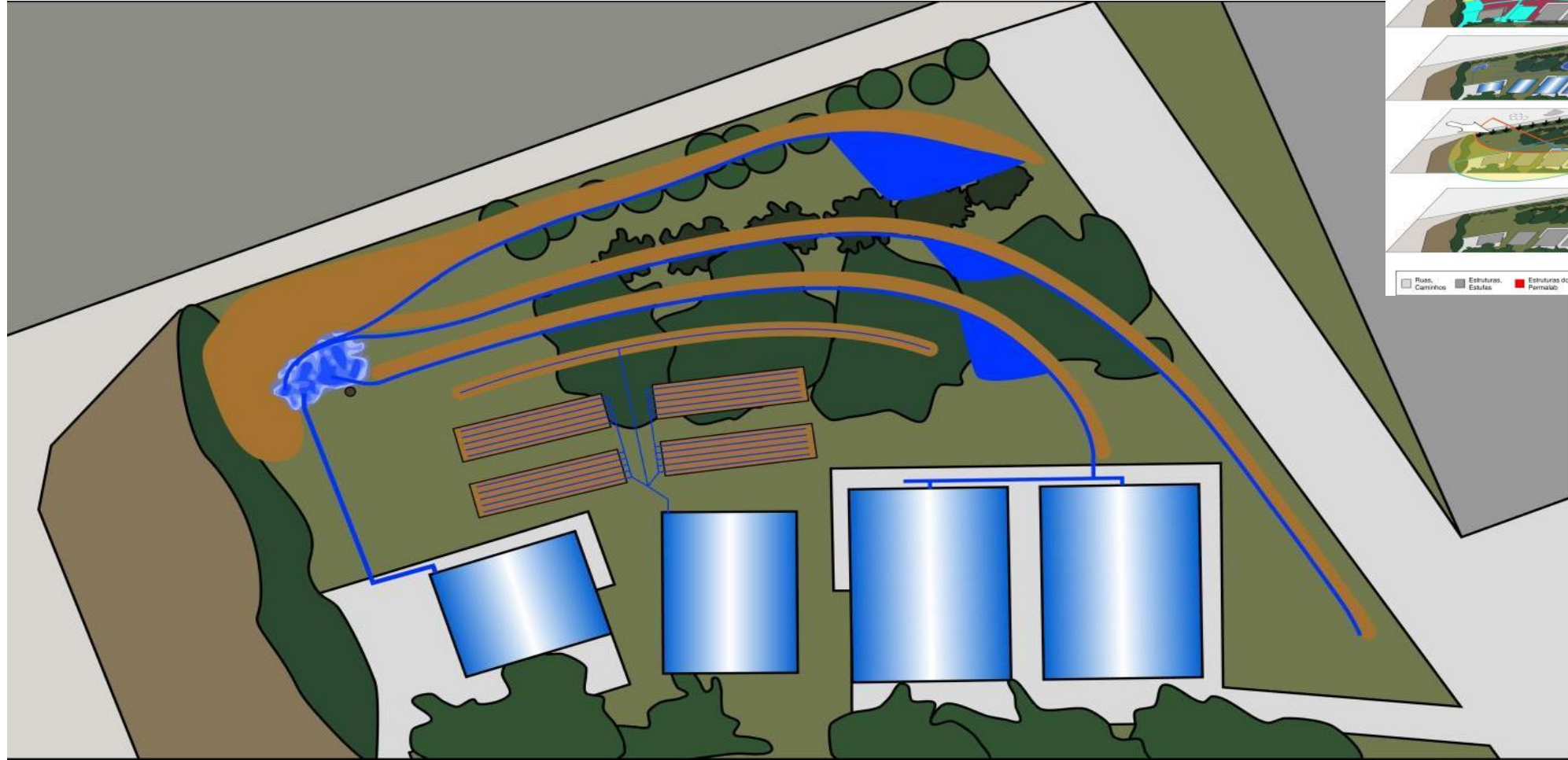
A white icon on a blue background. It shows a glass of water with a single water drop falling from the center. Below the glass is a white arrow pointing downwards.

TARGET 6-3



**IMPROVE WATER
QUALITY, WASTEWATER
TREATMENT AND SAFE
REUSE**

Water cycle



Estruturas

Plano Geral

Recursos Hídricos

Vento, Exposição solar, Poluição do ar, Poluição sonora

Mapa Base



Water cycle



Grey water
plant based
treatment



Swales, Lakes and fruit trees

TARGET 12-3



**HALVE GLOBAL PER
CAPITA FOOD WASTE**

Organic Cycle



TARGET 13-2



**INTEGRATE CLIMATE
CHANGE MEASURES
INTO POLICIES AND
PLANNING**

Organic cycle



Compostor FCUL (campus green waste)



Organic cycle

Give us your **NON-COOKED ORGANIC WASTE**
(e.g. salad, fruit, wood sticks and napkin)



Valuing the organic waste!

During the congress, a lot of potential residues will be produced! As Nature and its ecological processes, we see it as an abundance of resources and a great opportunity to close the congress organic cycle. We will selective collect the organic leftovers and use it to feed our red worms and black soldiers flies (BSF) in the vermicomposting station of Faculty of Sciences. In the end, we will have a high-quality compost to enrich our campus soils and BSF larvae to feed our chickens as protein supplement. So please, during the coffee breaks, choose wise where to put your residues if you want to help to improve our soils, take care our chickens and help to grow organic food!



Vermicompostor (canteens organic waste)



TARGET 12-6



ENCOURAGE
COMPANIES TO ADOPT
SUSTAINABLE
PRACTICES AND
SUSTAINABILITY
REPORTING

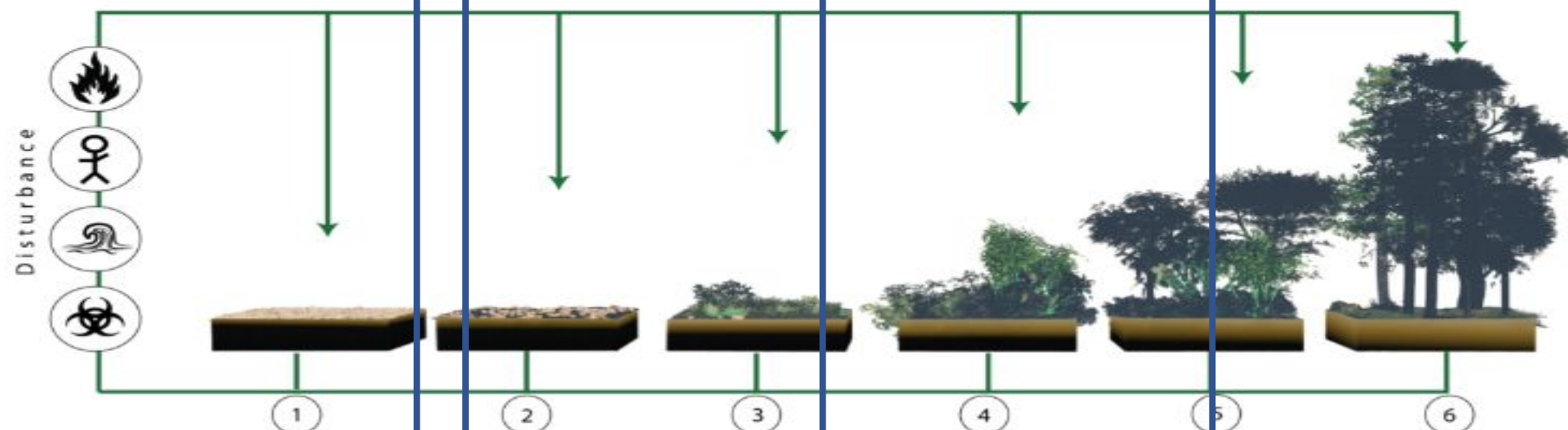
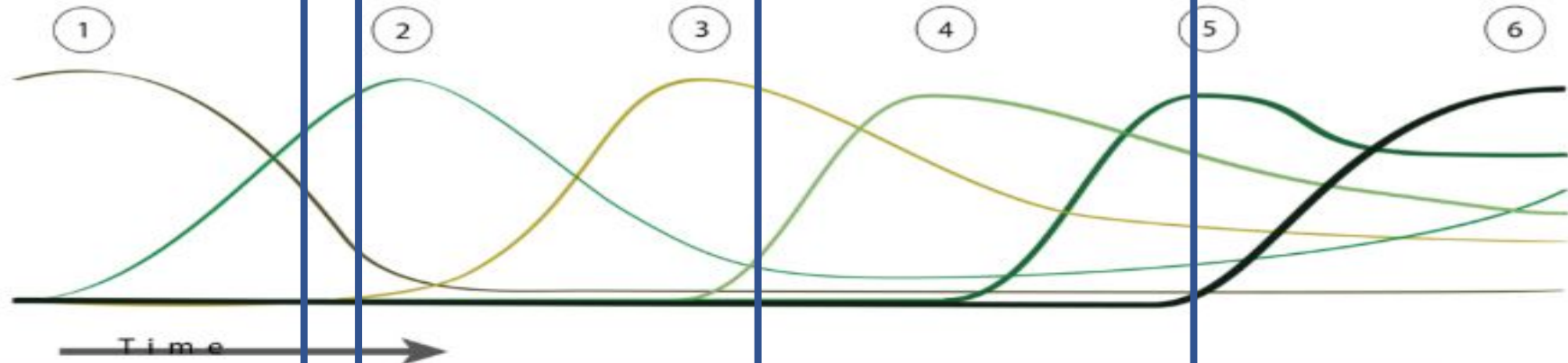
Agro Cycle



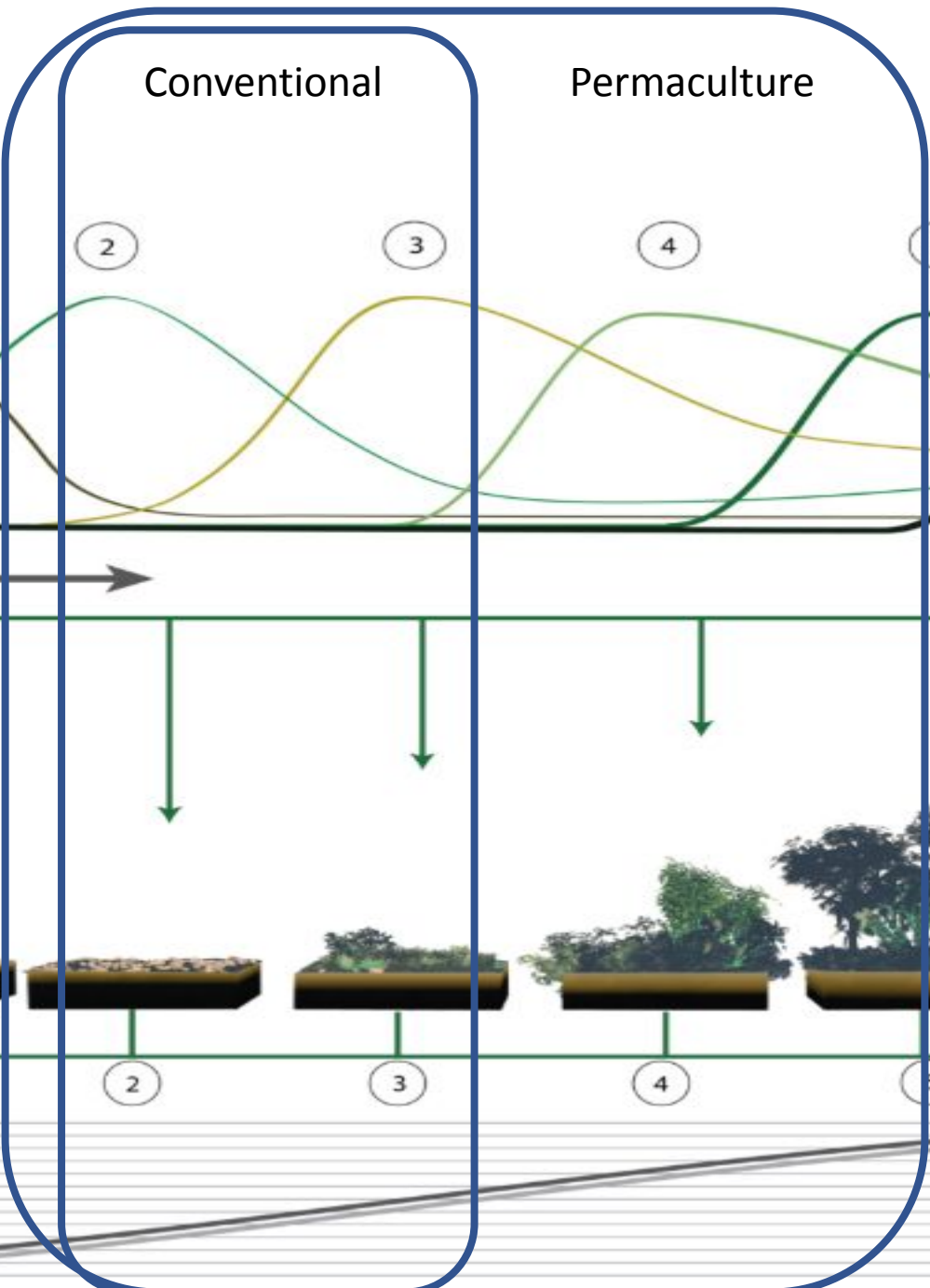
Ecology

Forest Succession Over Time In Six Stages

- 1 Bare Rock
- 2 Mosses
Grasses
- 3 Grasses
Perennials
- 4 Woody
Pioneers
- 5 Fast
Growing
Trees
- 6 Climax
Forest



Increase over Time
Biodiversity
Biomass
Soil Layer



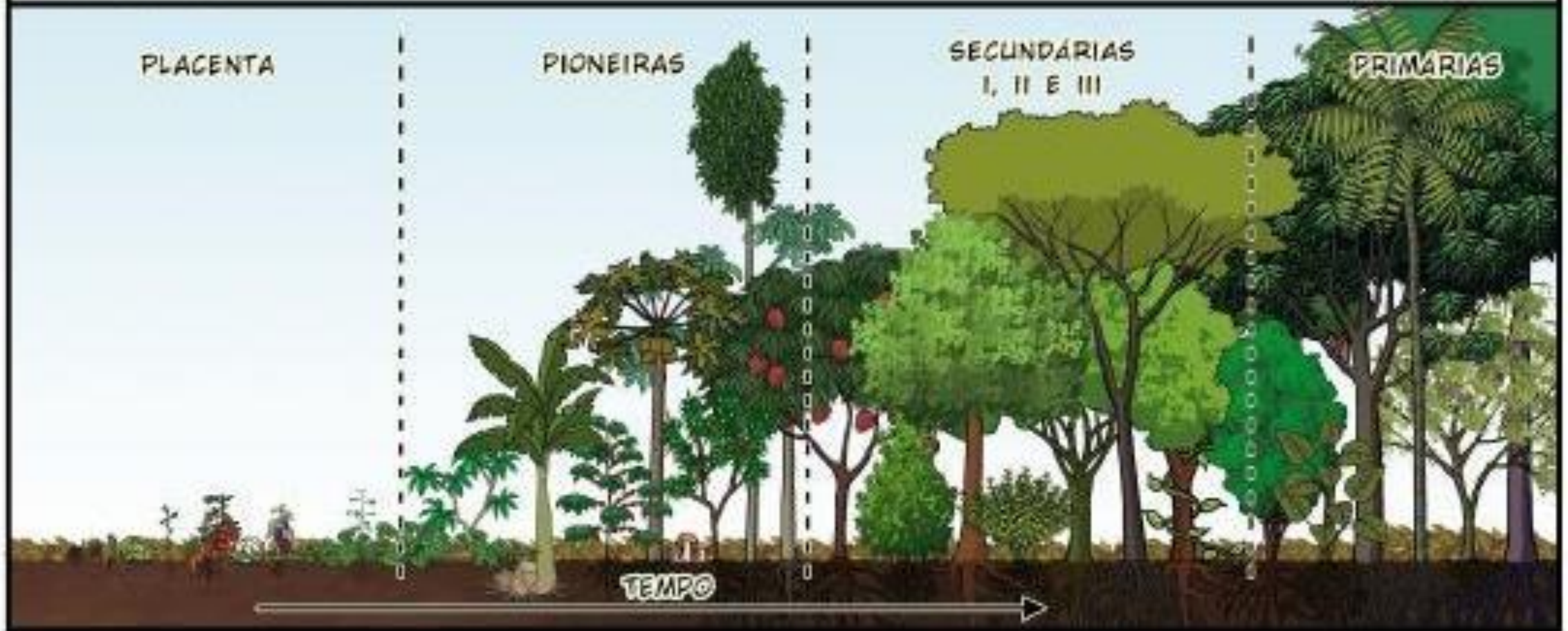
Layers

NA FLORESTA,
AS PLANTAS OCUPAM DIFERENTES
ESPAÇOS, SE DISTRIBUINDO EM DIVERSAS ALTURAS
CHAMADAS DE ESTRATOS. DESTA FORMA, A LUZ SOLAR
É FILTRADA A CADA ESTRATO, INFLUENCIANDO
O TIPO DE PLANTA QUE CRESCE
EM CADA "ANDAR".



Time sequence

OUTRO FATOR IMPORTANTE NAS ORGANIZAÇÕES DAS FLORESTAS É O TEMPO. CADA PLANTA POSSUI UM CICLO DE VIDA COM RITMOS DE CRESCIMENTO DIFERENTES QUE SÃO INFLUENCIADOS PELAS CARACTERÍSTICAS DAQUELE LOCAL. CHAMAMOS ESSA ORGANIZAÇÃO TEMPORAL DE SUCESSÃO ECOLÓGICA.

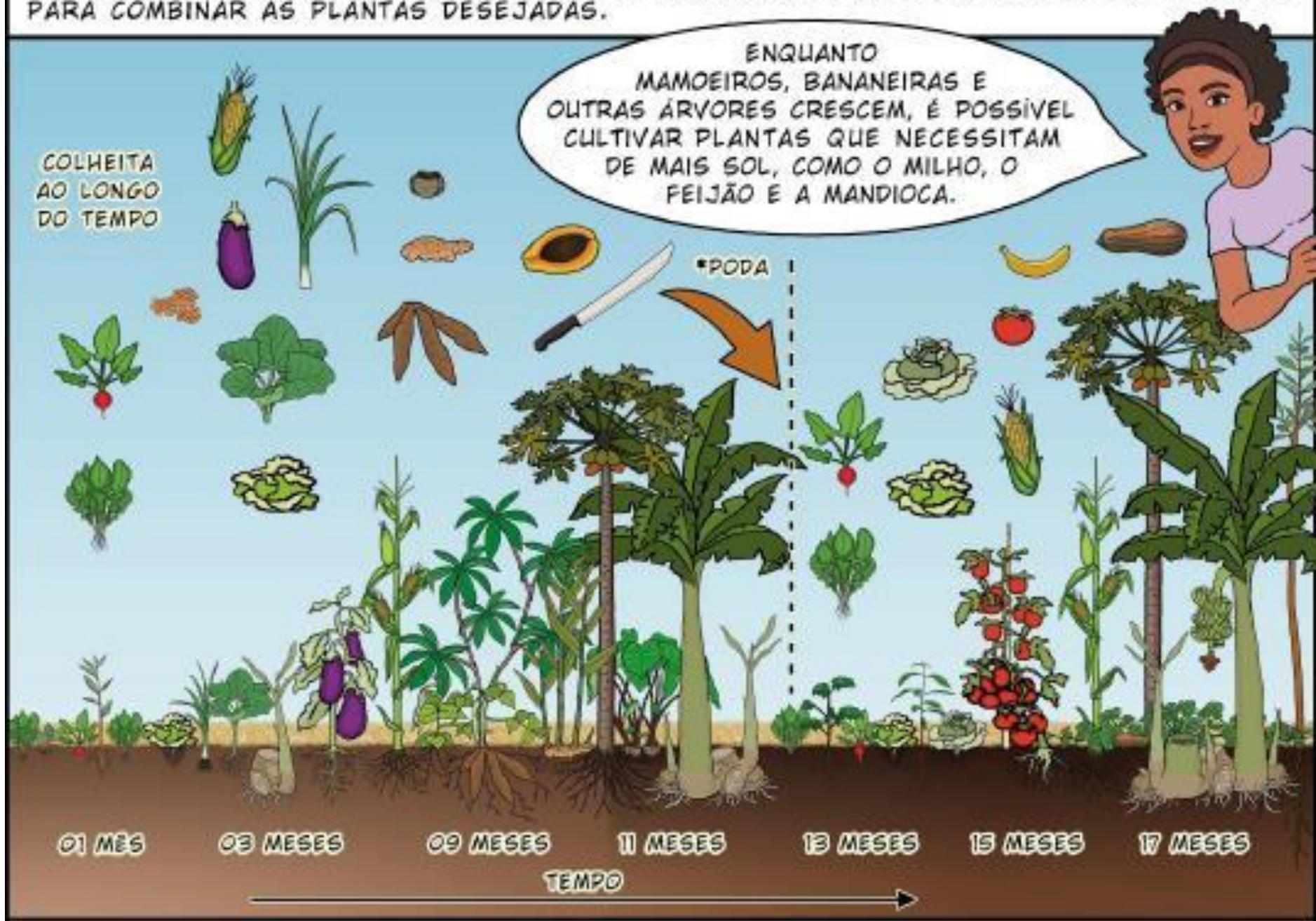


ASSIM, O PLANEJAMENTO AGROFLORESTAL DEVERÁ CONSIDERAR OS ESTRATOS E A SUCESSÃO PARA COMBINAR AS PLANTAS DESEJADAS.

ENQUANTO MAMOEIROS, BANANEIRAS E OUTRAS ÁRVORES CRESCEM, É POSSÍVEL CULTIVAR PLANTAS QUE NECESSITAM DE MAIS SOL, COMO O MILHO, O FEIJÃO E A MANDIOCA.

COLHEITA
AO LONGO
DO TEMPO

PODA



01 MES

03 MESES

09 MESES

11 MESES

13 MESES

15 MESES

17 MESES

TEMPO

Chicken tractor



COMPANION PLANTING

windowbox.com

PLANTS GROW WELL TOGETHER

BENEFICIAL TO GARDEN IN GENERAL






COMBINATION HELPS BUG CONTROL

CARROTS WILL HAVE GOOD FLAVOR BUT STUNTED ROOTS

DON'T PLANT TOGETHER

COMPANION PLANTING CHART

BASIL 	OREGANO, PEPPERS, TOMATOES, SAGE, THYME
BEANS 	BROCCOLI, CARROTS, CAULIFLOWER, CORN, CUCUMBER, PEAS, ROSEMARY, STRAWBERRY, SWISS CHARD, TOMATOES, THYME, SAGE, CHIVES, GARLIC, LEEKS, MARIGOLD, ONION, PEPPERS
BROCCOLI 	BEANS, CARROTS, CHIVES, CUCUMBER, DILL, GARLIC, LETTUCE, NASTURTIUM, ONION, ROSEMARY, SAGE, SPINACH, SWISS CHARD, THYME, OREGANO, PEPPERS, SQUASH, STRAWBERRY, TOMATOES
CARROTS 	BEANS, BROCCOLI, CAULIFLOWER, CHIVES, LEEKS, LETTUCE, ONION, PARSLEY, PEAS, PEPPERS, ROSEMARY, SAGE, THYME, TOMATOES, DILL
CAULIFLOWER 	BEANS, CARROTS, CHIVES, CUCUMBER, DILL, GARLIC, LETTUCE, NASTURTIUM, ONION, ROSEMARY, SAGE, SPINACH, SWISS CHARD, THYME, OREGANO, PEPPERS, SQUASH, STRAWBERRY, TOMATOES
CHIVES 	BROCCOLI, CARROTS, CAULIFLOWER, PARSLEY, TOMATOES, SAGE, THYME, PEAS, BEANS
CILANTRO 	SAGE, THYME, SPINACH
CORN 	BEANS, CUCUMBER, DILL, MELON, PARSLEY, PEAS, SQUASH, SUNFLOWER, SAGE, THYME, TOMATOES
CUCUMBER 	BEANS, BROCCOLI, CAULIFLOWER, CORN, DILL, LETTUCE, NASTURTIUM, ONION, PEAS, PEPPERS, TOMATOES, THYME, SAGE
DILL 	BROCCOLI, CAULIFLOWER, CORN, CUCUMBER, LETTUCE, ONION, SAGE, THYME, CARROTS, TOMATOES

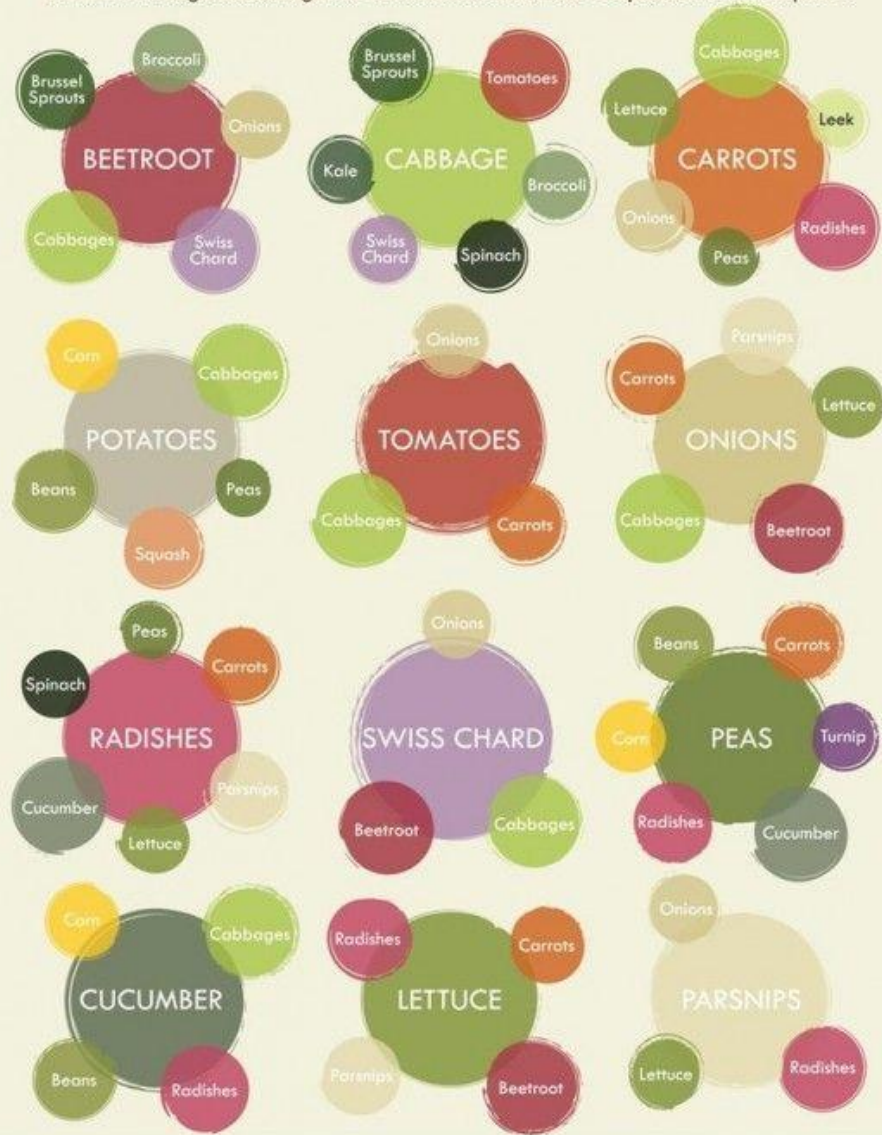
GARLIC 	BROCCOLI, CAULIFLOWER, LETTUCE, STRAWBERRY, TOMATOES, THYME, SAGE, BEANS, PEAS
LEEK 	CARROTS, ONION, SPINACH, SAGE, THYME, BEANS, PEAS
LETTUCE 	BROCCOLI, CARROTS, CAULIFLOWER, CUCUMBER, DILL, GARLIC, ONION, SPINACH, SQUASH, STRAWBERRY, TOMATOES, SAGE, THYME
MARIGOLD 	MELON, TOMATOES, SAGE, THYME, SQUASH, BEANS
MELON 	CORN, MARIGOLD, NASTURTIUM, SQUASH, SUNFLOWER, SAGE, THYME
NASTURTIUM 	BROCCOLI, CAULIFLOWER, CUCUMBER, MELON, TOMATOES, SAGE, THYME, SQUASH
ONION 	BROCCOLI, CARROTS, CAULIFLOWER, CUCUMBER, DILL, LEEKS, LETTUCE, PARSLEY, STRAWBERRY, SWISS CHARD, TOMATOES, SAGE, THYME, BEANS, PEAS
OREGANO 	BASIL, PEPPERS, BROCCOLI, CAULIFLOWER, SAGE, THYME
PARSLEY 	CARROTS, CHIVES, CORN, ONION, PEAS, PEPPERS, TOMATOES, SAGE, THYME
PEAS 	BEANS, CARROTS, CORN, CUCUMBER, PARSLEY, PEPPERS, SPINACH, SQUASH, STRAWBERRY, SAGE, THYME, CHIVES, GARLIC, LEEKS, ONION

PEPPERS 	BASIL, CARROTS, CUCUMBER, OREGANO, PARSLEY, PEAS, ROSEMARY, SQUASH, SWISS CHARD, TOMATOES, SAGE, THYME, BEANS, BROCCOLI, CAULIFLOWER
ROSEMARY 	BEANS, BROCCOLI, CARROTS, CAULIFLOWER, PEPPERS, SAGE, THYME
SAGE 	BROCCOLI, CARROTS, CAULIFLOWER, BASIL, BEANS, CHIVES, CILANTRO, CORN, DILL, GARLIC, LEEKS, LETTUCE, MARIGOLD, MELON, NASTURTIUM, ONION, OREGANO, PARSLEY, PEAS, PEPPERS, ROSEMARY, SAGE, SPINACH, SQUASH, STRAWBERRY, SUNFLOWER, SWISS CHARD, THYME, TOMATOES, CUCUMBER
SPINACH 	BROCCOLI, CAULIFLOWER, LEEKS, LETTUCE, PEAS, STRAWBERRY, SAGE, THYME, CILANTRO
SQUASH 	CORN, LETTUCE, MELON, PEAS, PEPPERS, SAGE, THYME, MARIGOLD, NASTURTIUM, BROCCOLI, CAULIFLOWER
STRAWBERRY 	BEANS, GARLIC, LETTUCE, ONION, PEAS, SPINACH, THYME, SAGE, BROCCOLI, CAULIFLOWER
SUNFLOWER 	CORN, MELON, SAGE, THYME
SWISS CHARD 	BEANS, BROCCOLI, CAULIFLOWER, ONION, PEPPERS, SAGE, THYME
THYME 	BROCCOLI, CAULIFLOWER, STRAWBERRY, BASIL, BEANS, CARROTS, CHIVES, CILANTRO, CORN, CUCUMBER, DILL, GARLIC, LEEKS, LETTUCE, MARIGOLD, MELON, NASTURTIUM, ONION, OREGANO, PARSLEY, PEAS, PEPPERS, ROSEMARY, SAGE, SPINACH, SQUASH, SUNFLOWER, SWISS CHARD, THYME, TOMATOES
TOMATOES 	BASIL, BEANS, CHIVES, CUCUMBER, GARLIC, LETTUCE, MARIGOLD, NASTURTIUM, ONION, PARSLEY, PEPPERS, SAGE, THYME, CARROTS, BROCCOLI, CAULIFLOWER, CORN, DILL

COMPANION PLANTING



Plant these vegetables together to make the most use of space and deter pests.



TARGET 12-8



PROMOTE UNIVERSAL
UNDERSTANDING OF
SUSTAINABLE
LIFESTYLES

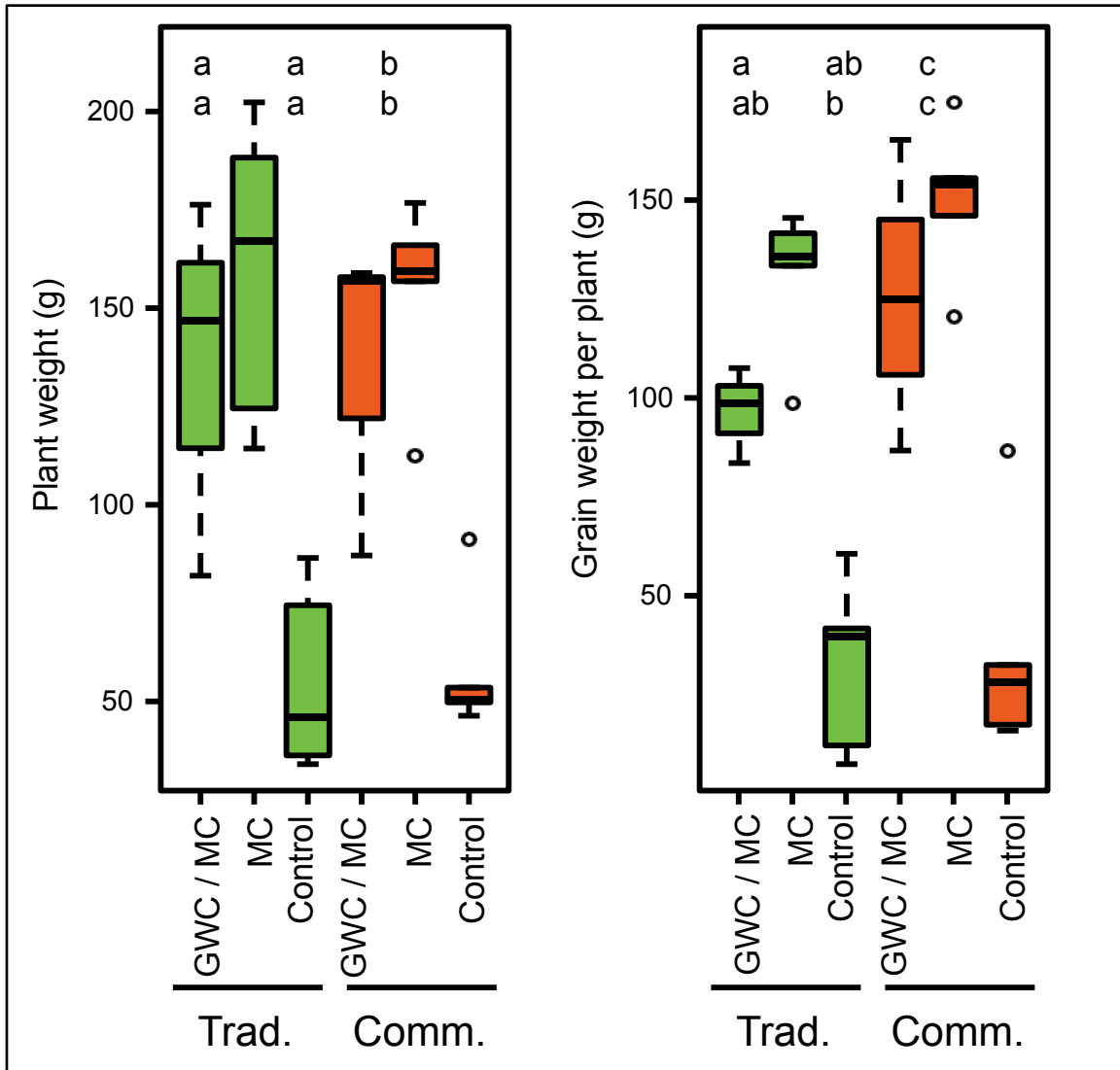
Knowledge Cycle



Knowledge cycle



● Production



GWC / MC:
25 % Green Waste Compost
75 % Municipal Compost

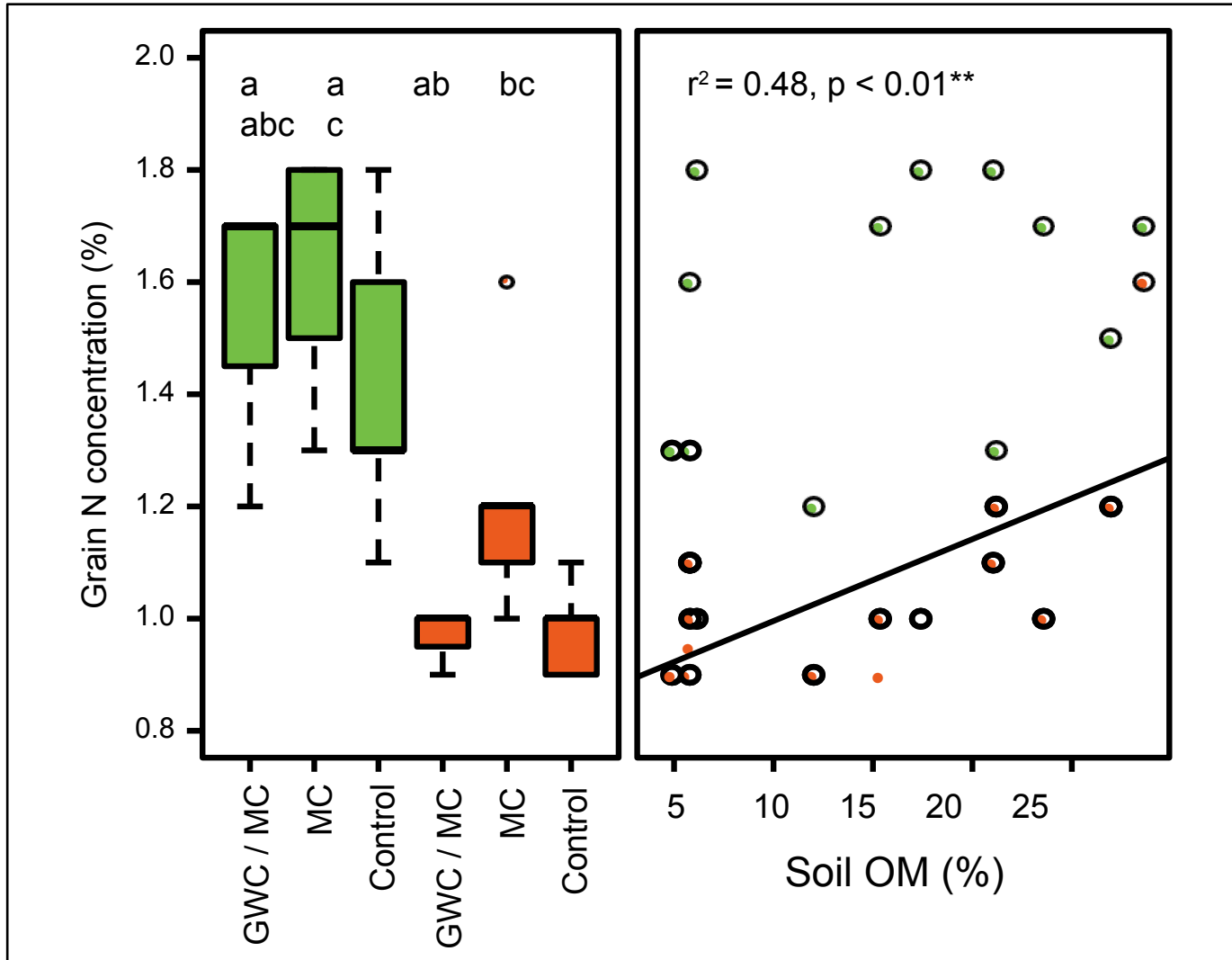
MC:
100 % Municipal Compost

Control:
Soil without amendment

Traditional Variety

Commercial Variety

● N-use efficiency



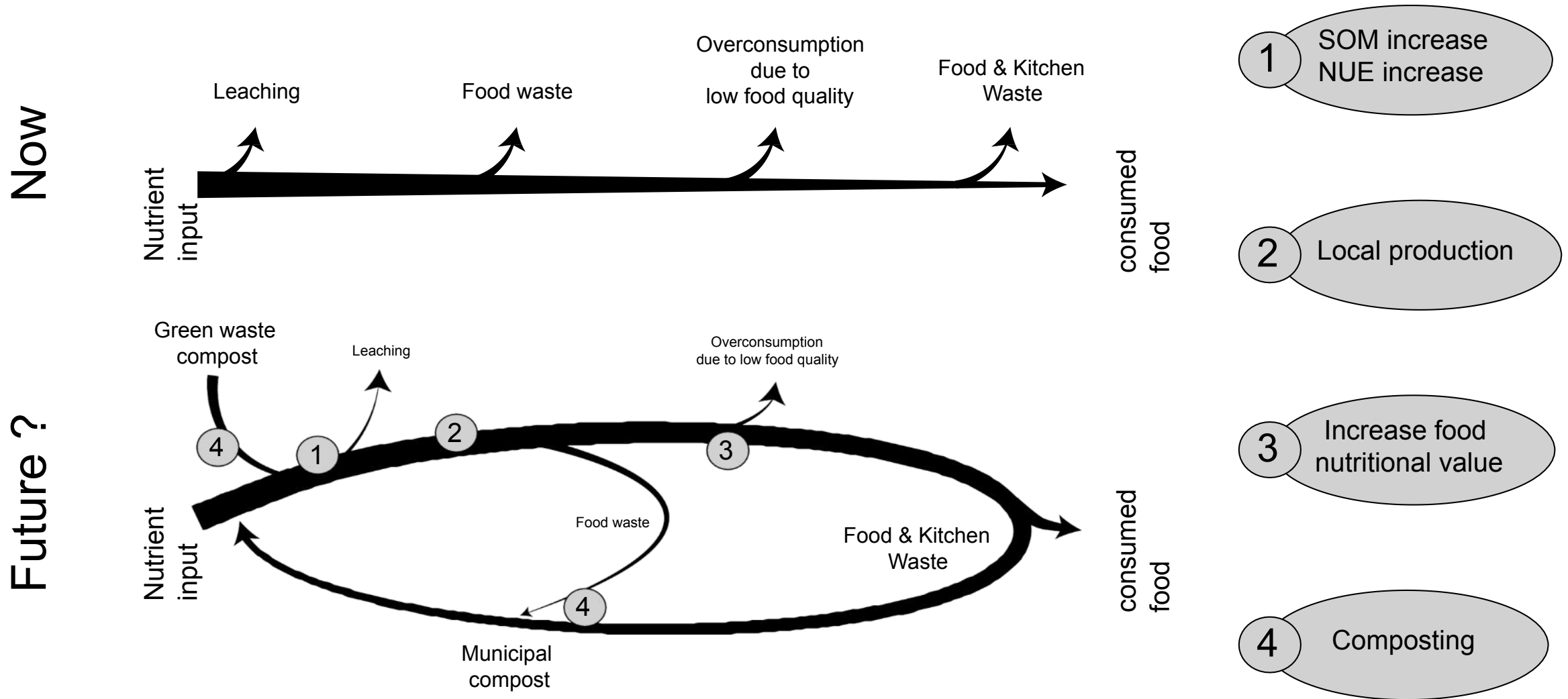
Commercial Variety

Traditional Variety

Ulm F., Avelar D., Hobson P., Penha-Lopes G., Dias T., Máguas C., Cruz C. (2019).

Sustainable urban agriculture using compost and an open-pollinated maize variety. *Journal of Cleaner Production*, Vol. 212, pp. 622-629

● Potential solution?



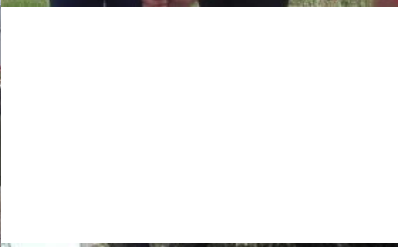
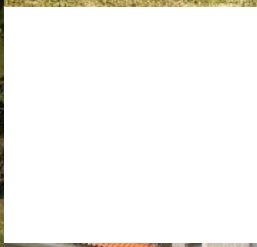
Ulm F., Avelar D., Hobson P., Penha-Lopes G., Dias T., Máguas C., Cruz C. (2019).

Sustainable urban agriculture using compost and an open-pollinated maize variety. *Journal of Cleaner Production*, Vol. 212, pp. 622-629

Know



Kno



TARGET 12-5

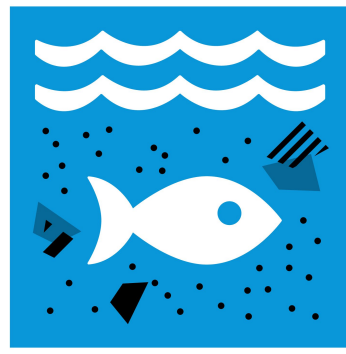


**SUBSTANTIALLY
REDUCE WASTE
GENERATION**

Other “Waste” (Re)Cycle



TARGET 14-1



**REDUCE MARINE
POLLUTION**

Recycle, Reuse, Reduce



**Greenhouse
rehabilitation**

**Wood
recycle**



Green wall

Carpet recycle



Social Cycle

17 PARTNERSHIPS
FOR THE GOALS



TARGET 17-6

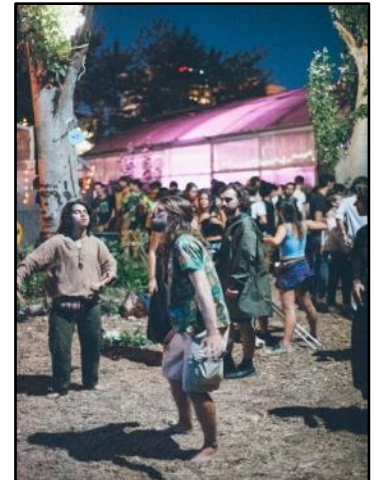


KNOWLEDGE SHARING
AND COOPERATION FOR
ACCESS TO SCIENCE,
TECHNOLOGY AND
INNOVATION

Social cycle



Social cycle



... must be fun!



Exposição “Hortas de Lisboa – Da Idade Média ao Século XXI”

- | | | | | | | | | | | | |
|----------------------|------------------------|------------------------|------------------|------------|--------------------|---------------------|--------------------|----------------------|---------------------|-----------------------------|-----------------|
| 1. Comida armazenada | 4. Viveiro de plantas | 7. Resíduos da cozinha | 10. Água da rede | 13. Ave | 16. Atmosfera | 19. Hortelão | 22. Borboleta | 25. Micorriza | 28. Árvore de fruta | 31. Caixa-ninho de morcegos | 34. Compostor |
| 2. Livros | 5. Berçário de plantas | 8. Caixa para papel | 11. Chaminé | 14. Nuvens | 17. Vermicompostor | 20. Sistema de rega | 23. Vala ou charco | 26. Canteiro elevado | 29. Smartphone | 32. Árvore | 35. Resíduos de |

CÍCLO GASOSO



Exposição “Hortas de Lisboa – Da Idade Média ao Século XXI”

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CÍCLO GASOSO

CÍCLO DA ÁGUA



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CÍCLO GASOSO

CÍCLO DA ÁGUA

CÍCLO ORGÂNICO



Exposição “Hortas de Lisboa – Da Idade Média ao Século XXI”

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CÍCLO GASOSO

CÍCLO DA ÁGUA

CÍCLO ORGÂNICO

CÍCLO DOS NUTRIENTES



Exposição “Hortas de Lisboa – Da Idade Média ao Século XXI”

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| 1. Comida armazenada | 4. Viveiro de plantas | 7. Resíduos da cozinha | 10. Água da rede | 13. Ave | 16. Atmosfera | 19. Hortelão | 22. Borboleta | 25. Micorriza | 28. Árvore de fruta | 31. Caixa-ninho de morcegos | 34. Compostor |
| 2. Livros | 5. Berçário de plantas | 8. Caixote para papel | 11. Chaminé | 14. Nuvens | 17. Vermicompostor | 20. Sistema de rega | 23. Vala ou charco | 26. Canteiro elevado | 29. Smartphone | 32. Árvore | 35. Resíduos de |

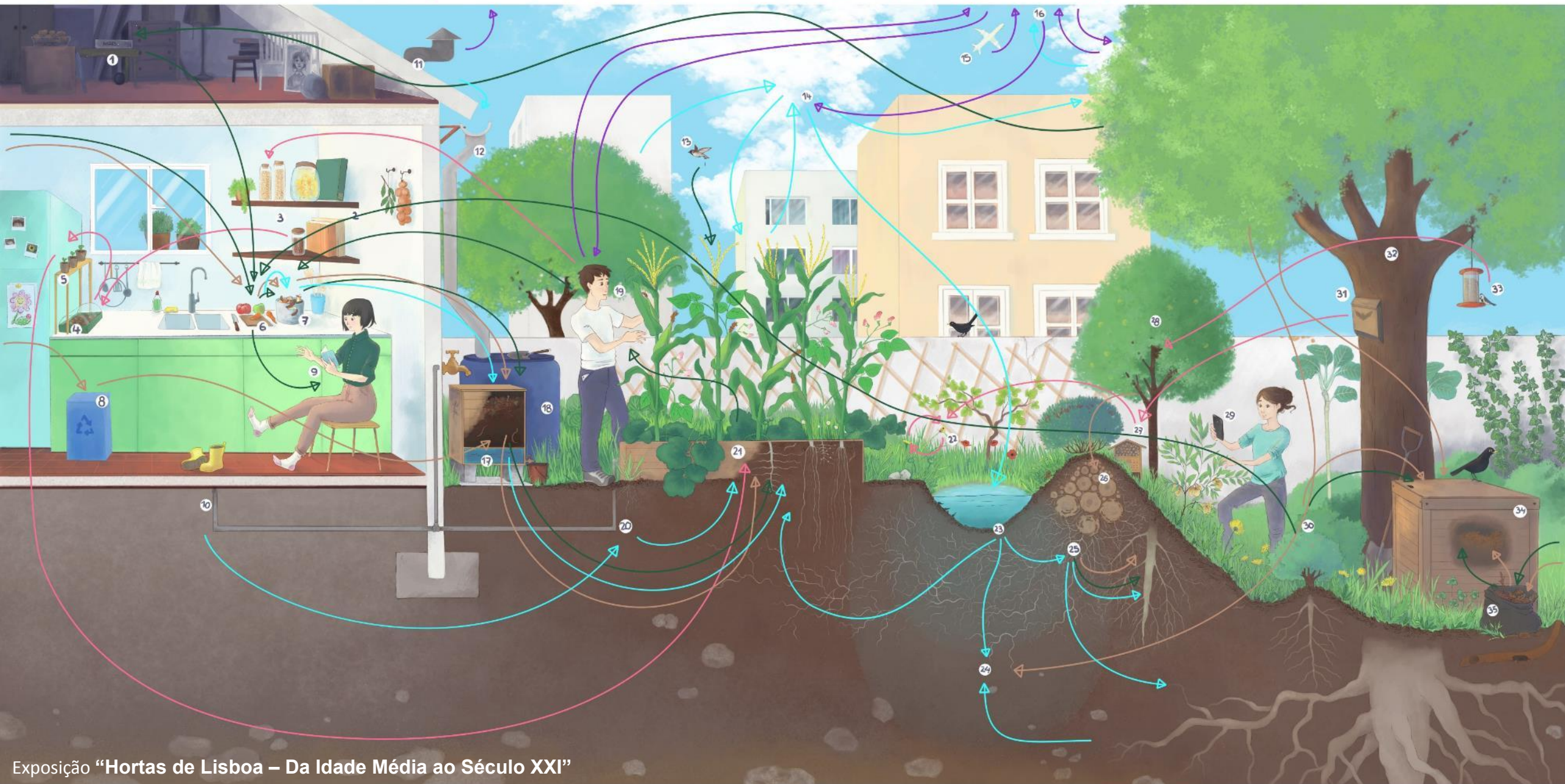
CÍCLO GASOSO

CÍCLO DA ÁGUA

CÍCLO ORGÂNICO

CÍCLO DOS NUTRIENTES

CÍCLO DA VIDA



Exposição “Hortas de Lisboa – Da Idade Média ao Século XXI”

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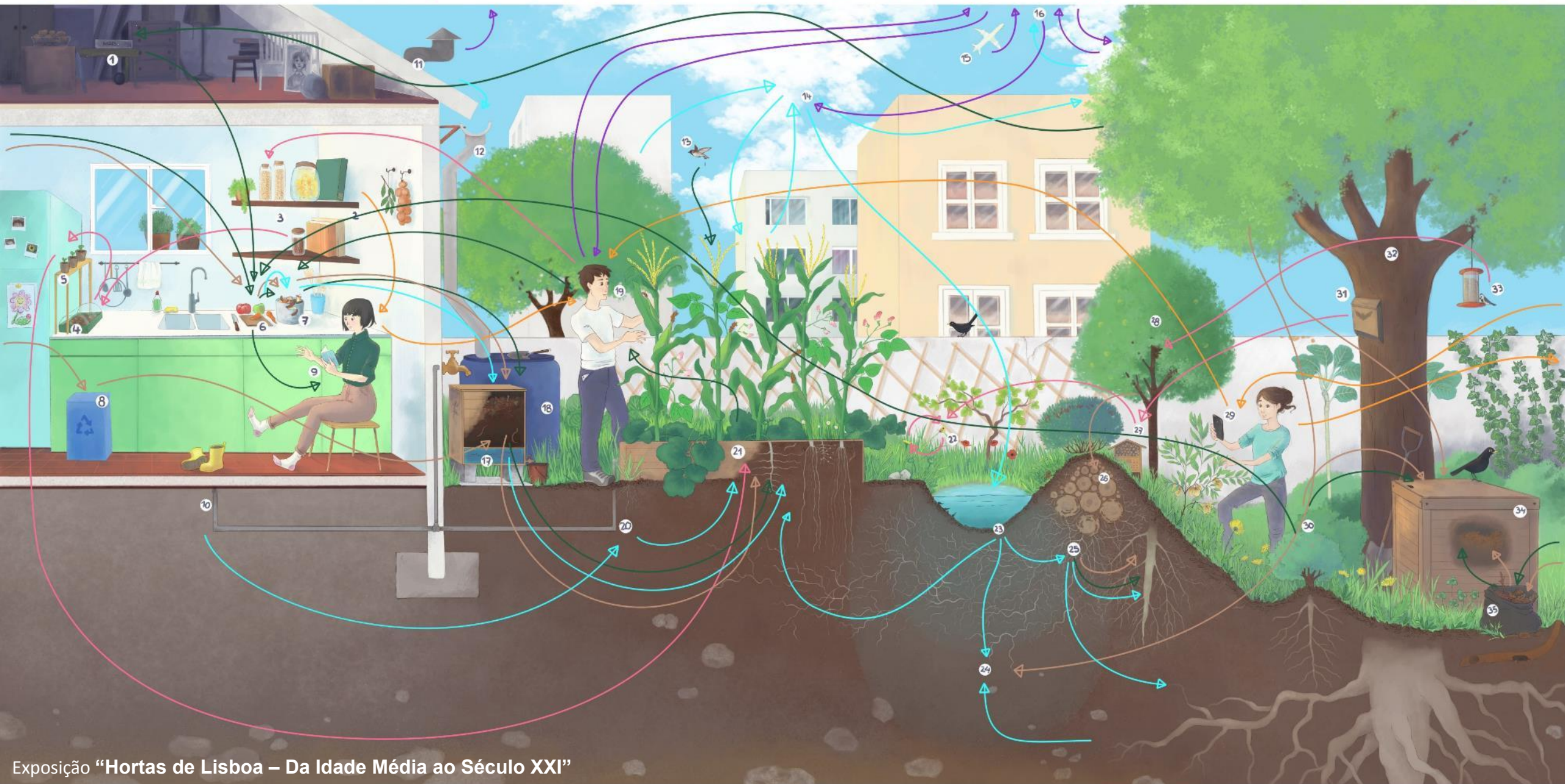
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CÍCLO DA VIDA

CÍCLO DO CONHECIMENTO



Exposição “Hortas de Lisboa – Da Idade Média ao Século XXI”

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FCULresta

A dense and biodiverse
mini forest



Faculdade de Ciências da Universidade de Lisboa

112 m

Google Earth



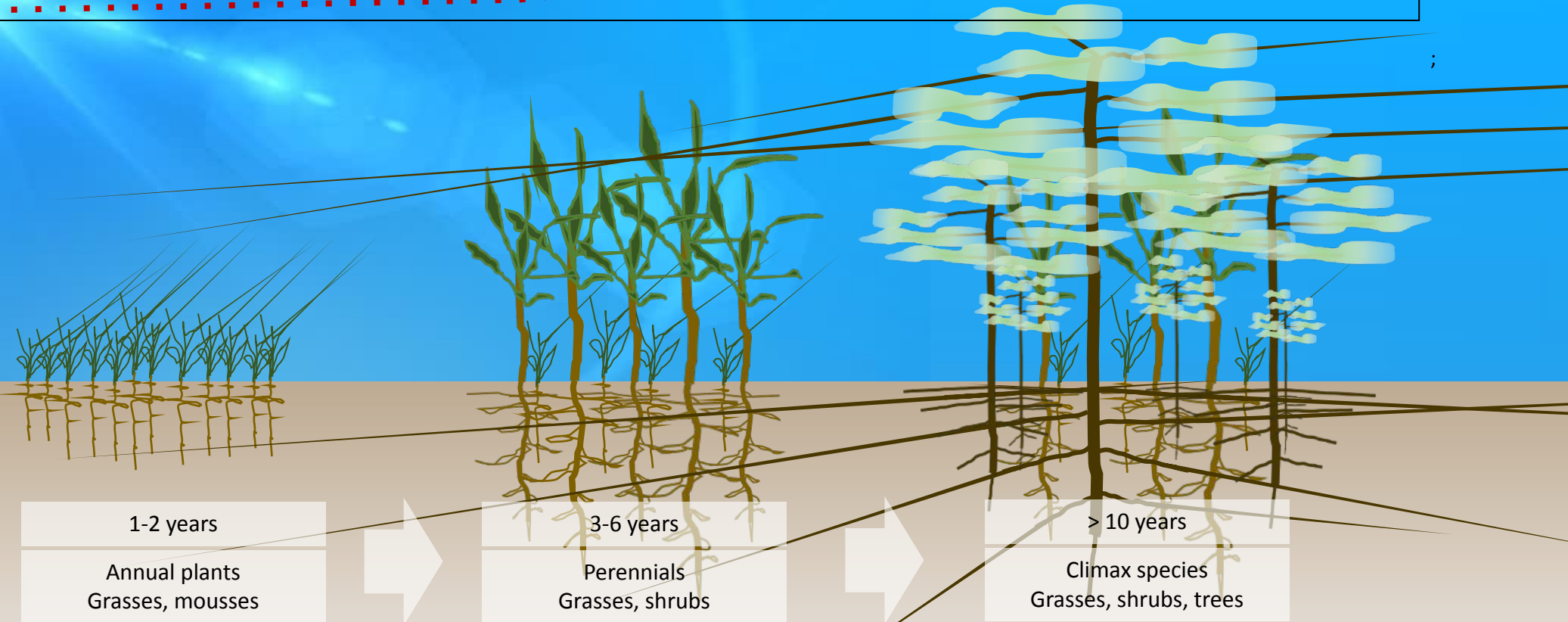
- Porquê o ícone “infinito” do ODS 12?

12 RESPONSIBLE
CONSUMPTION
AND PRODUCTION



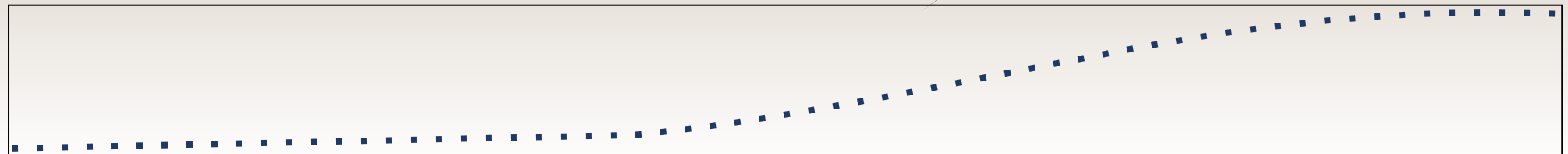
LIFE increasing SOLAR entropy

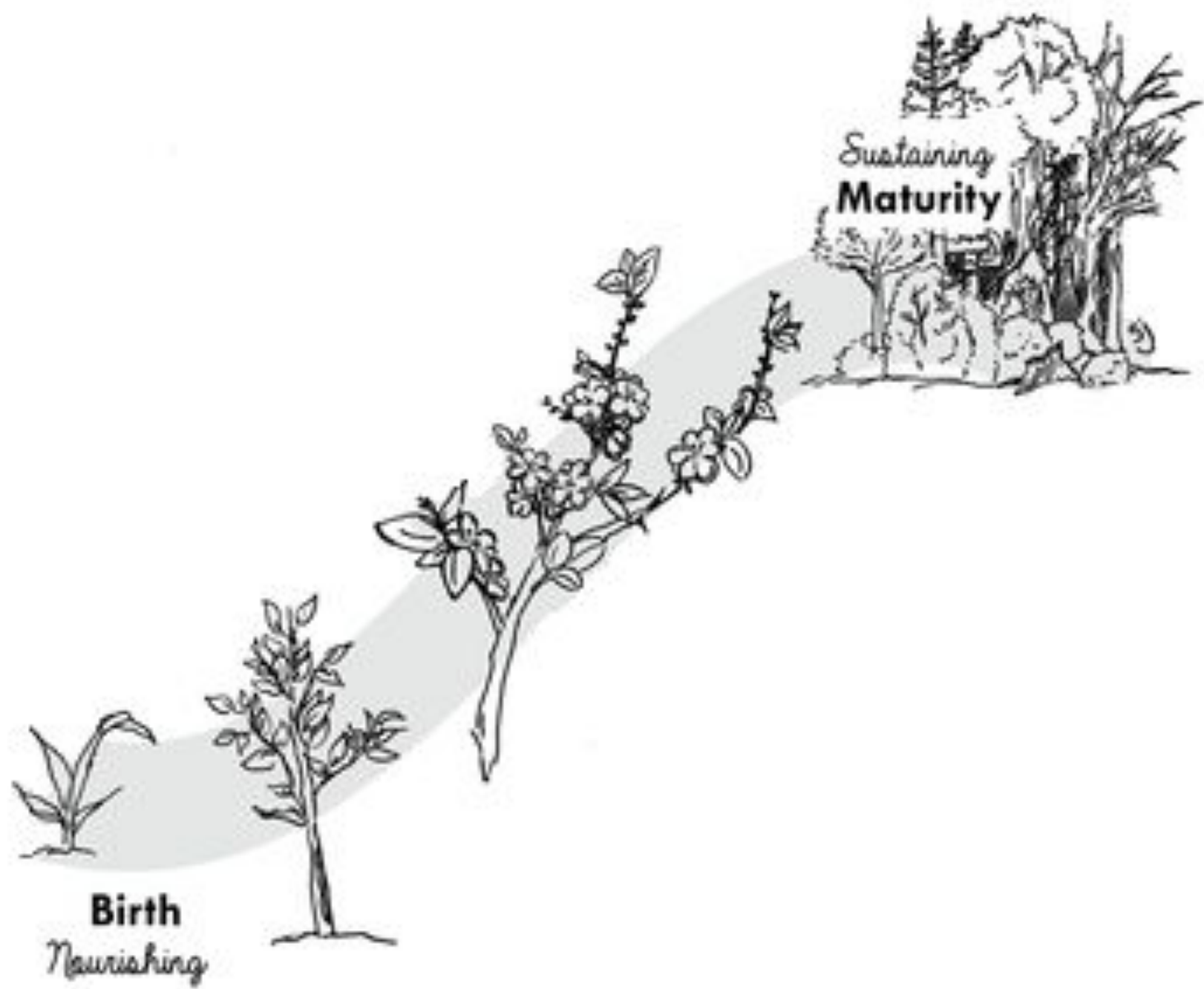
Entropy



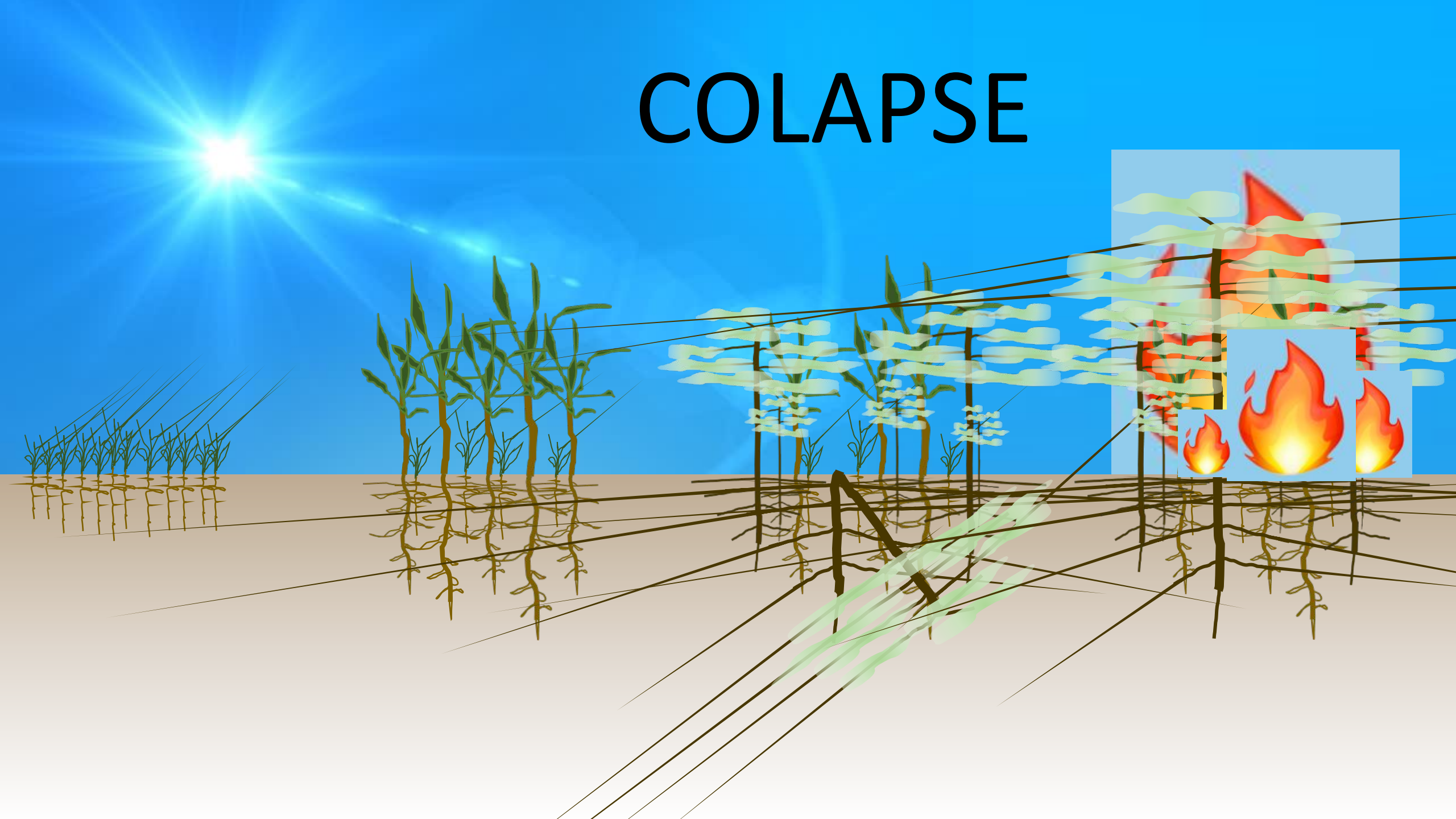
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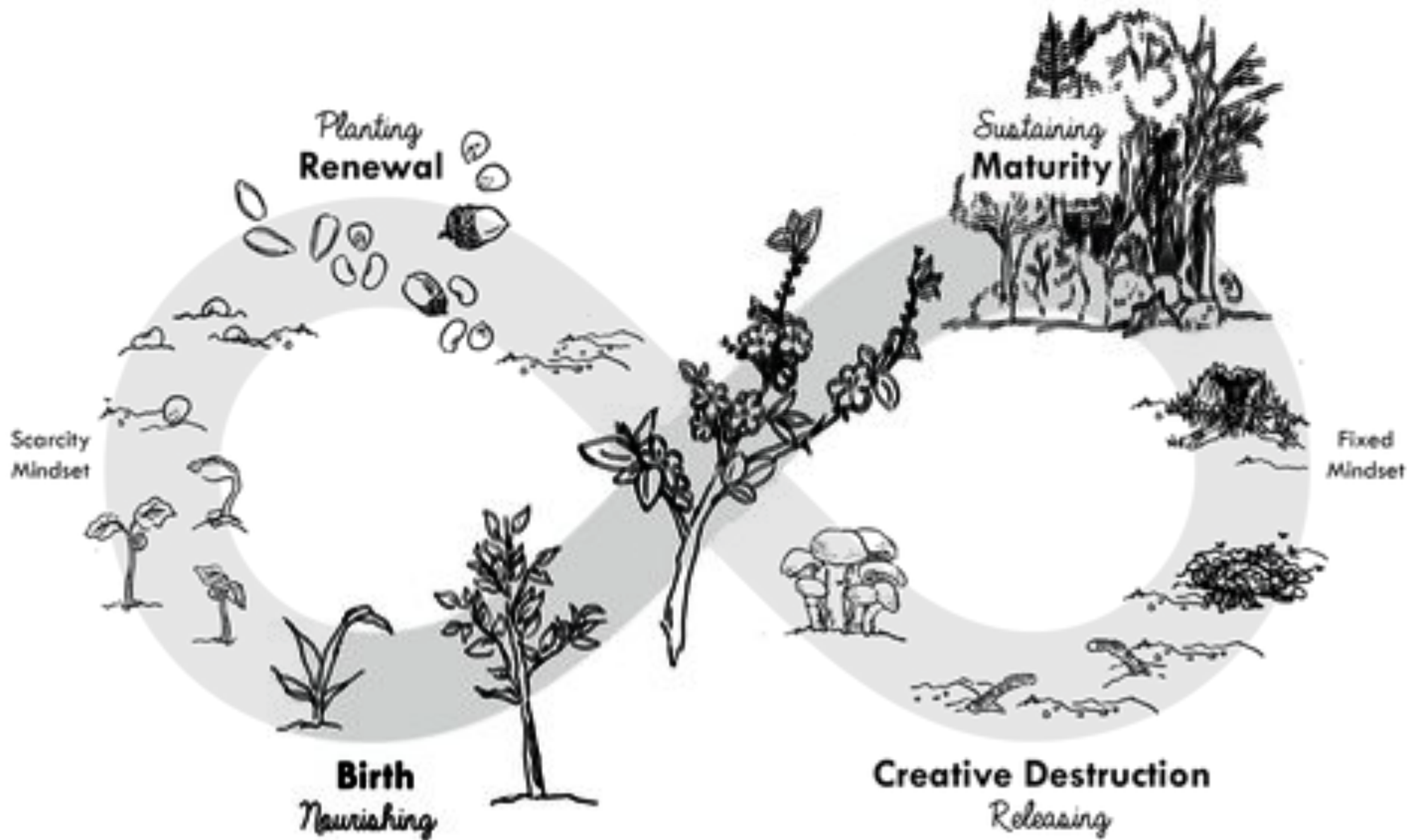
Biomass
Information
Network



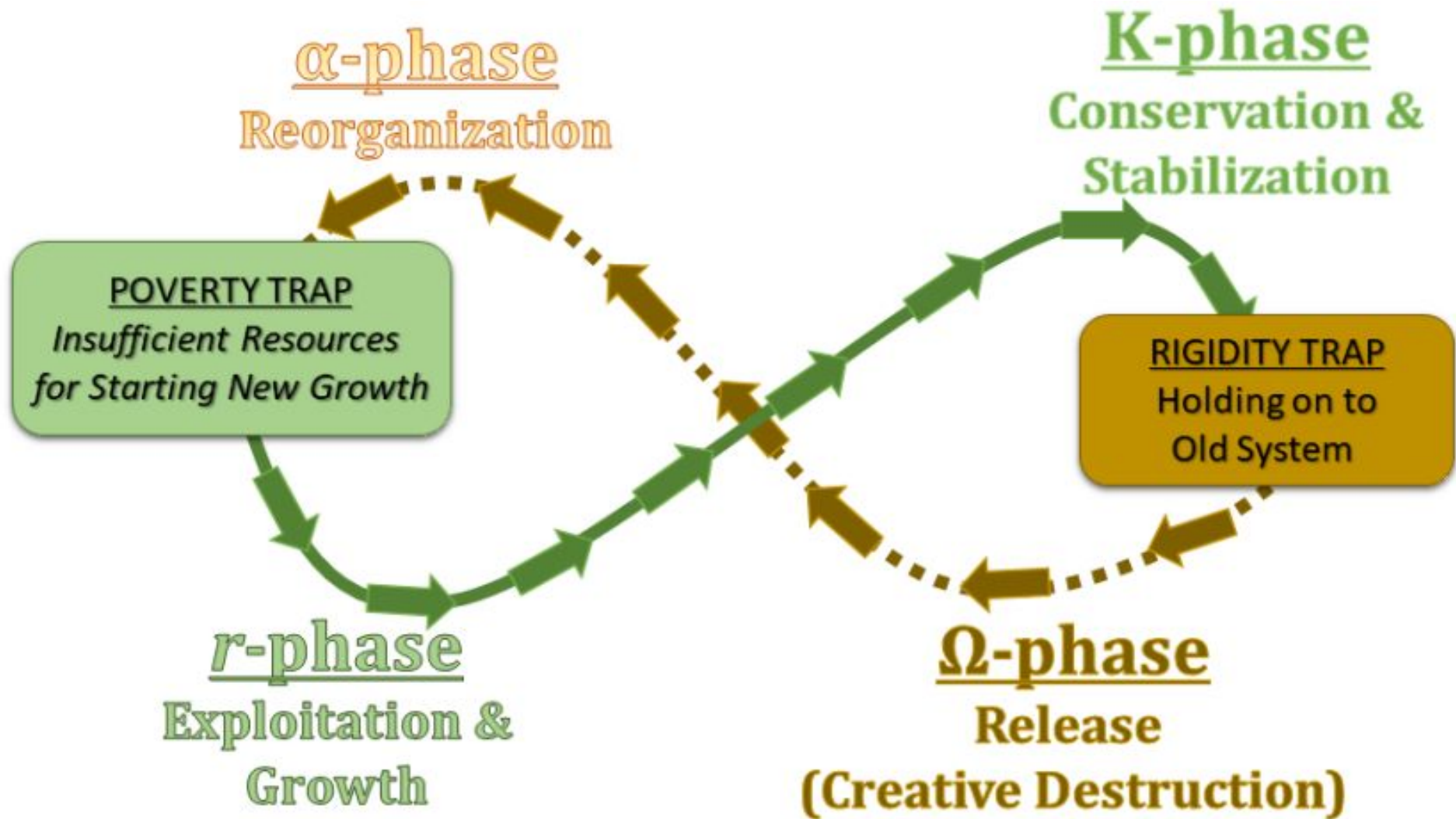


COLAPSE



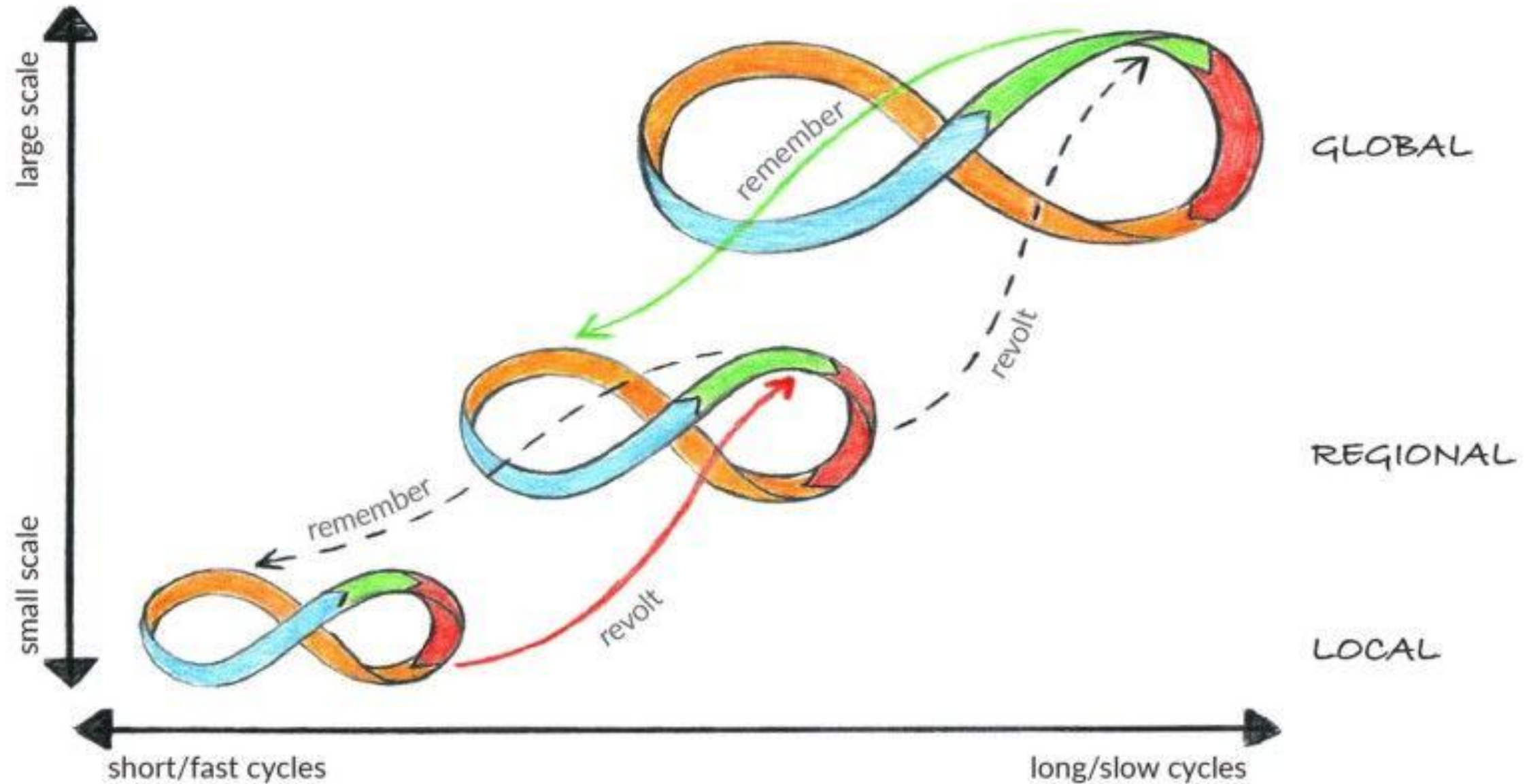


Adaptive cycle



Based on: Gunderson, L. H., & Holling, C. S. (Eds.). (2002). *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington, DC: Island Press. and 2005 presentation by Keith McCandless, June Holley, Lisa Kimball "Through the Panarchy Lens"

PANARCHY OF INTERCONNECTED ADAPTIVE CYCLES AT DIFFERENT SPATIAL AND TEMPORAL SCALES



UC Sustentabilidade (FCSE - 1º Ciclo)

OBRIGADO

T8.

Produção e Consumo Sustentável

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

<p>TARGET 12-1</p> <p>IMPLEMENT THE 10-YEAR SUSTAINABLE CONSUMPTION AND PRODUCTION FRAMEWORK</p>	<p>TARGET 12-2</p> <p>SUSTAINABLE MANAGEMENT AND USE OF NATURAL RESOURCES</p>	<p>TARGET 12-3</p> <p>HALVE GLOBAL PER CAPITA FOOD WASTE</p>	<p>TARGET 12-4</p> <p>RESPONSIBLE MANAGEMENT OF CHEMICALS AND WASTE</p>	<p>TARGET 12-5</p> <p>SUBSTANTIALLY REDUCE WASTE GENERATION</p>	<p>TARGET 12-6</p> <p>ENCOURAGE COMPANIES TO ADOPT SUSTAINABLE PRACTICES AND SUSTAINABILITY REPORTING</p>	<p>TARGET 12-7</p> <p>PROMOTE SUSTAINABLE PUBLIC PROCUREMENT PRACTICES</p>	<p>TARGET 12-8</p> <p>PROMOTE UNIVERSAL UNDERSTANDING OF SUSTAINABLE LIFESTYLES</p>	<p>TARGET 12-A</p> <p>SUPPORT DEVELOPING COUNTRIES' SCIENTIFIC AND TECHNOLOGICAL CAPACITY FOR SUSTAINABLE CONSUMPTION AND PRODUCTION</p>	<p>TARGET 12-B</p> <p>DEVELOP AND IMPLEMENT TOOLS TO MONITOR SUSTAINABLE TOURISM</p>	<p>TARGET 12-C</p> <p>REMOVE MARKET DISTORTIONS THAT ENCOURAGE WASTEFUL CONSUMPTION</p>
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