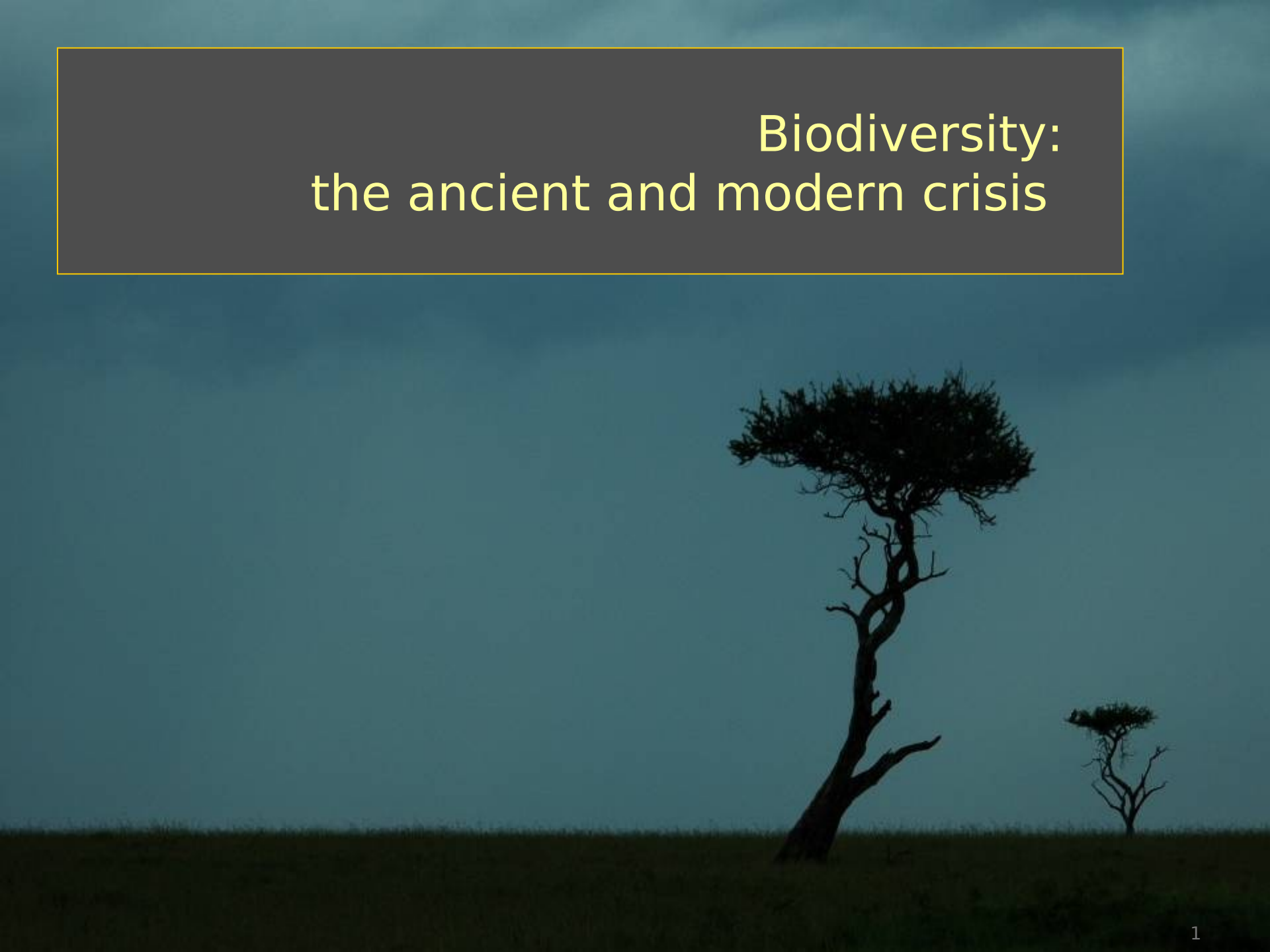
Biodiversity: the ancient and modern crisis



a personal note

- I grew up in Africa
  - Never once went to a “game park”
- Went back this Christmas
  - The pristine African bush is gone
  - All large mammals geologically extinct
  - Abrupt change in one man’s lifetime
  - Human seizure of habitat, not climate change
- Now I have a story to tell you…

Once upon a time...

- **...there was a hominid**

and this is its story

It’s the story of how it…

- swiftly came to dominate its planet
- emerged as a geological force
- created the “Holocene extinction”
- destabilised its entire planet
- put its own future in question

It lived in Africa, where it was

- aware of, and part of, living world
- observant, thoughtful, well-organized
- competitive, efficient, systematic
- social, capable of teaching + learning
- capable of complex conscious design
- able to put to use
  - stones

  but more especially
  - the biological diversity around it

It developed something entirely new…

Technology

- Stone tools
- Bone tools
- Leather tools
- Wooden tools
- Fire
- Dogs
- Language
- Symbolism


0ky

Hominids everywhere

- 5km a year for 100 000 years
  - by land (on foot)
  - and sea (paddling, currents, wind)
- Gathering
  - berries, fruit, nuts, roots, eggs
- Scavenging
- Hunting
- Fishing

} animals

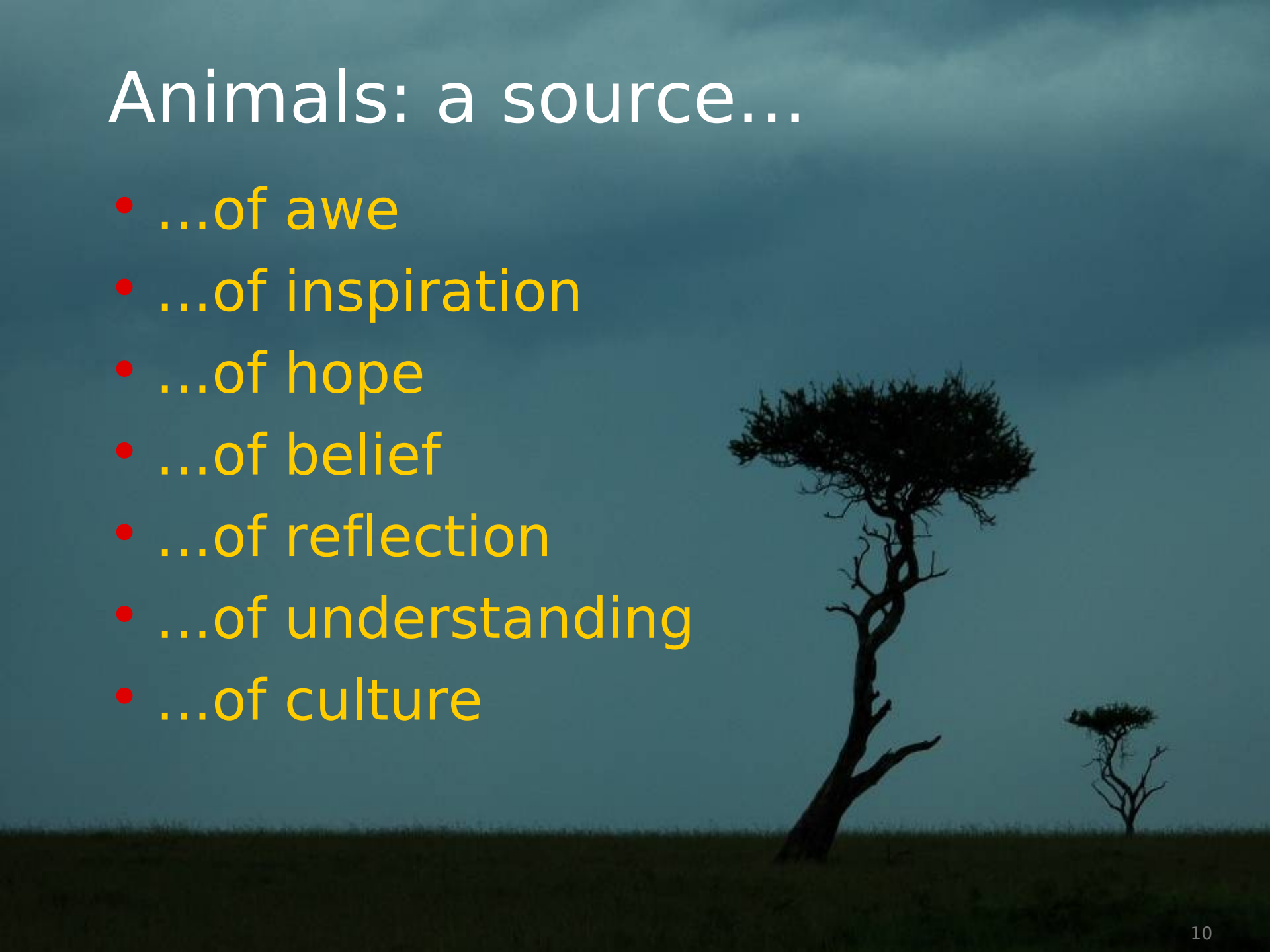
Animals: a vital resource

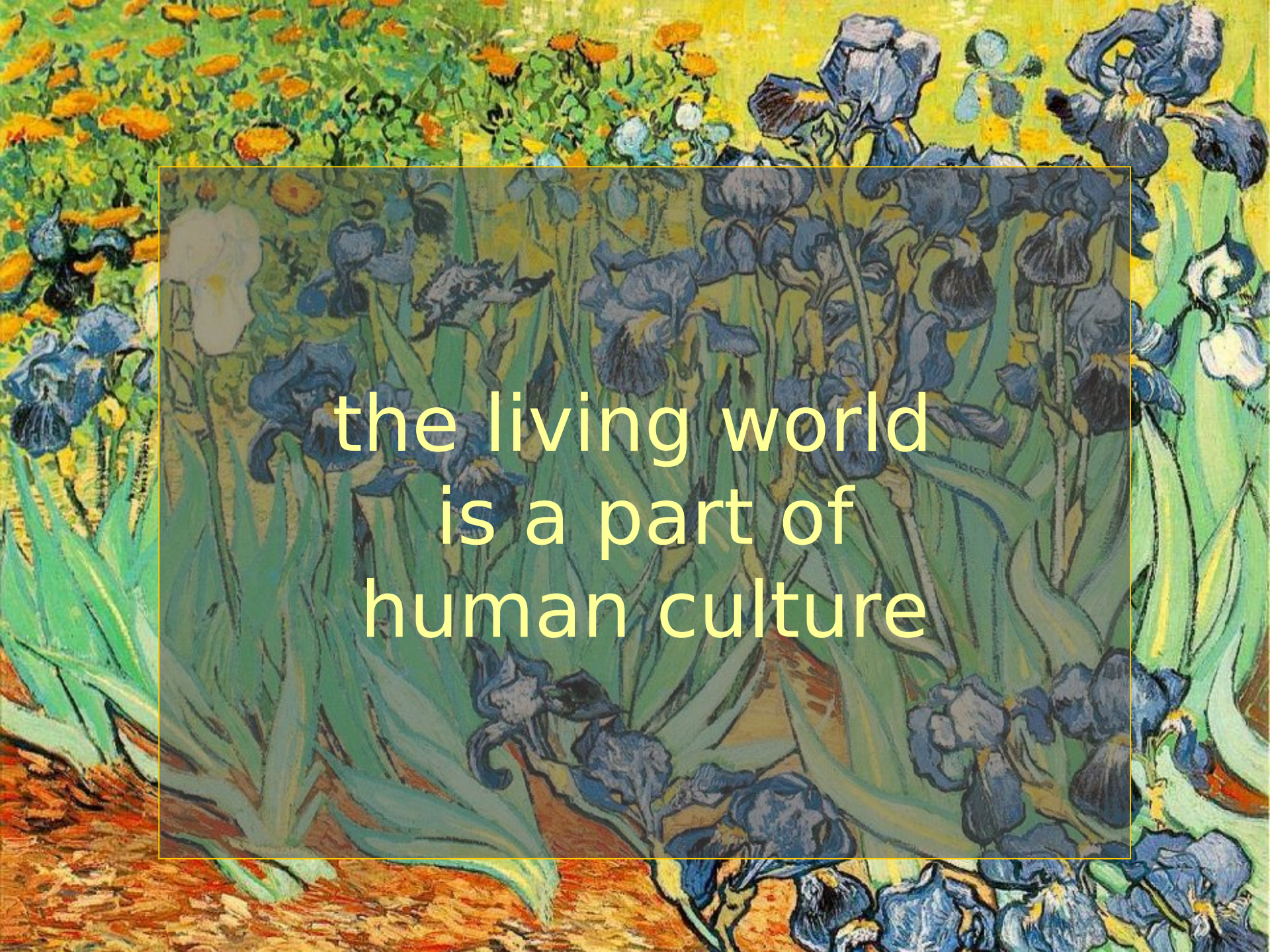
- Meat, fat, hides, sinew, bone
  - food
  - clothes
  - tools
  - glue
- Companionship, protection
  - cats and dogs
- Cost to living world
  - Disappearance of mega-fauna
    - Over-hunting
    - Over-harvesting
  - Selection of some species for domestic stock
    - Anthropogenic evolution
    - Rapid changes to genetic diversity
  - Association of opportunistic species
    - Pests: Rodents, ticks, fleas, mosquitoes

So much for the traditional knowledge of the noble savage!

Animals: a source...

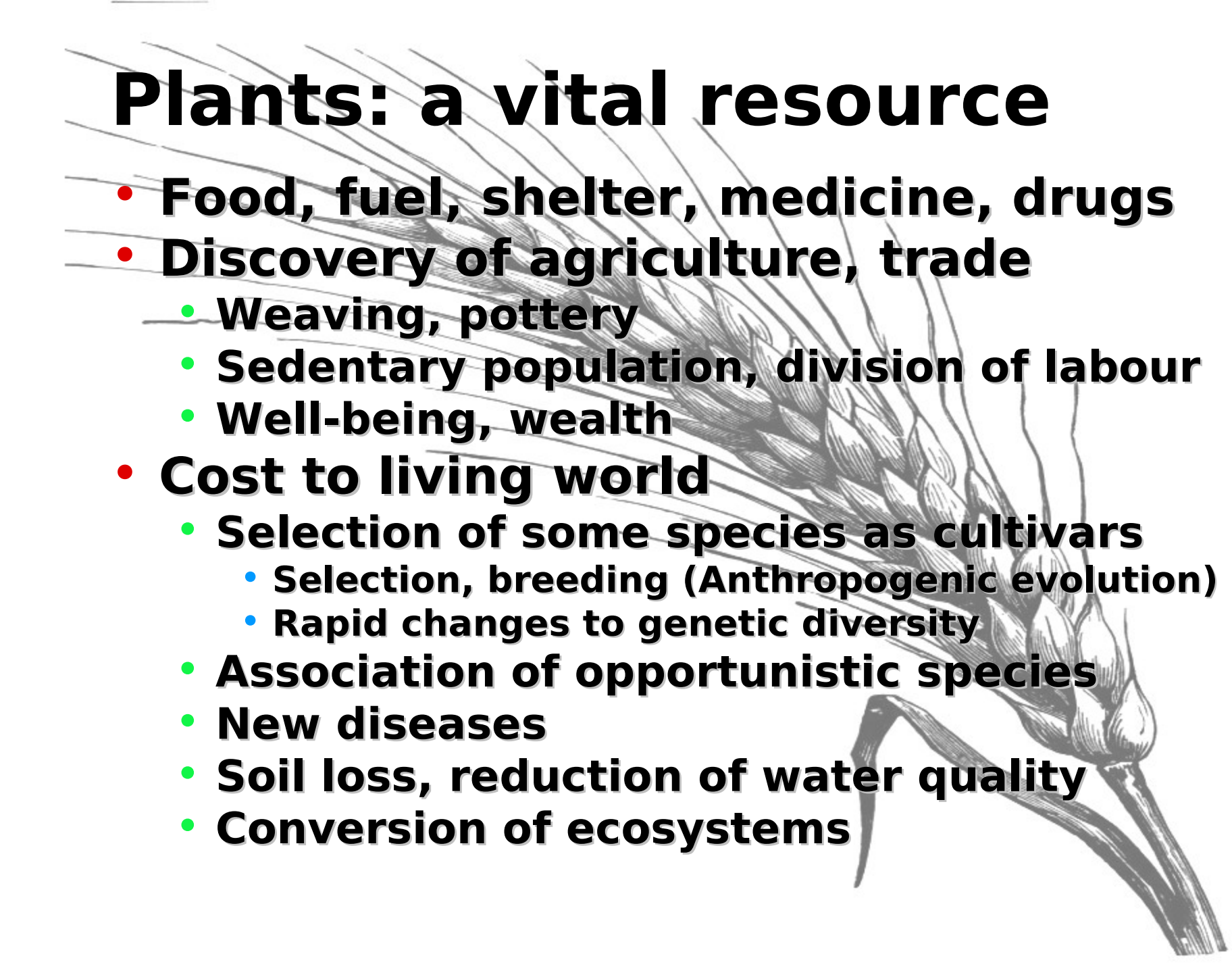
- ...of awe
- ...of inspiration
- ...of hope
- ...of belief
- ...of reflection
- ...of understanding
- ...of culture




the living world
is a part of
human culture

Plants: a vital resource

- Food, fuel, shelter, medicine, drugs
- Discovery of agriculture, trade
  - Weaving, pottery
  - Sedentary population, division of labour
  - Well-being, wealth
- Cost to living world
  - Selection of some species as cultivars
    - Selection, breeding (Anthropogenic evolution)
    - Rapid changes to genetic diversity
  - Association of opportunistic species
  - New diseases
  - Soil loss, reduction of water quality
  - Conversion of ecosystems



Conversion of forest

- fire → open landscapes
  - more productivity of domestic species
    - grazing
    - crops for fodder, food, fibre and fuel
- Recent and current process
  - In Europe, from 3900 BP to 500 BP
  - In tropics, from 50 BP to present
- Cost to living world
  - Habitat change
  - Fragmentation of remaining habitat
  - Loss of species

Humans choose a future

- Forest: frightening
- Open landscape: fruitful, comforting

Trade-off:

Walk further to get forest products

versus

More security

- of person
- of supply of domestic products

What biodiversity do we want?
Biodiversity is a choice of society.
But it is not a neutral choice.

Energy

- Why our ancestors invested in energy supply
  - Multiplies effectiveness of human effort
  - Keeps us warm
  - Gives us light
  - Gives access to a new range of food
  - Helps to keep us healthier
- Sources
  - fluid flows
    - wind, currents, waves
  - someone else's muscle
    - slave, ox, llama, dog, horse…
  - burning "biomass"
    - wood, straw, cow pats, oil…
  - burning fossil fuel from biomass
    - coal, oil
  - nuclear processes
    - sunshine, fission
- Cost to living world
  - Pollution
  - Habitat change
  - Fragmentation of remaining habitat
  - Loss of species

But their massive wide-spread adoption will hugely increase habitat change

Industrial revolution

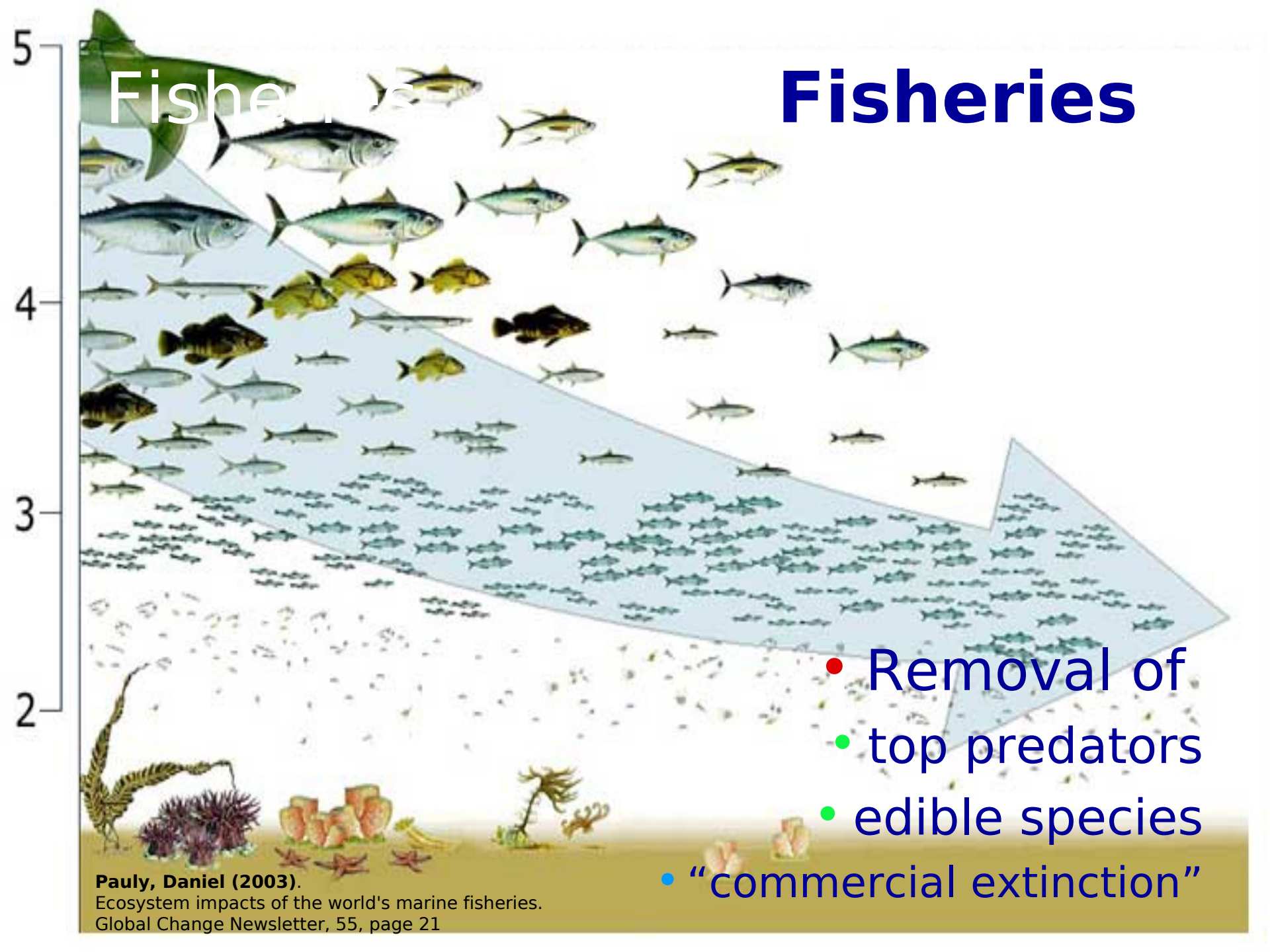
- **Hugely expanded economy**
  - **Wide variety of cheap goods**
  - **Trade and wealth**
  - **Great changes in human well-being**
- **Cost to living world**
  - **Further clearance of forest**
  - **Pollution**
    - **toxic wastes**
    - **particulates**
    - **eutrophication**
    - **nitrogen deposition**

Transport

- Economy, power and knowledge
  - Until recently, the horse was king
  - Move goods, people and news faster + with less effort
  - Exchange, trade, innovation, conquest
  - Wealth
- Cost to living world
  - Pollution
  - Habitat change
  - Fragmentation of remaining habitat
  - Movement of species, loss of species
  - Spread of disease
  - Exportation of damage

Cities

- Agriculture, transport, energy, medicine makes possible
  - Dizzying densities of humans
  - By exporting impact of unsustainable
    - consumption
    - production (including waste)
- cost to living world
  - Many costs similar to other activities
  - Greatest cost: disconnecting humans from the living world (“civilization”)


5
4
3
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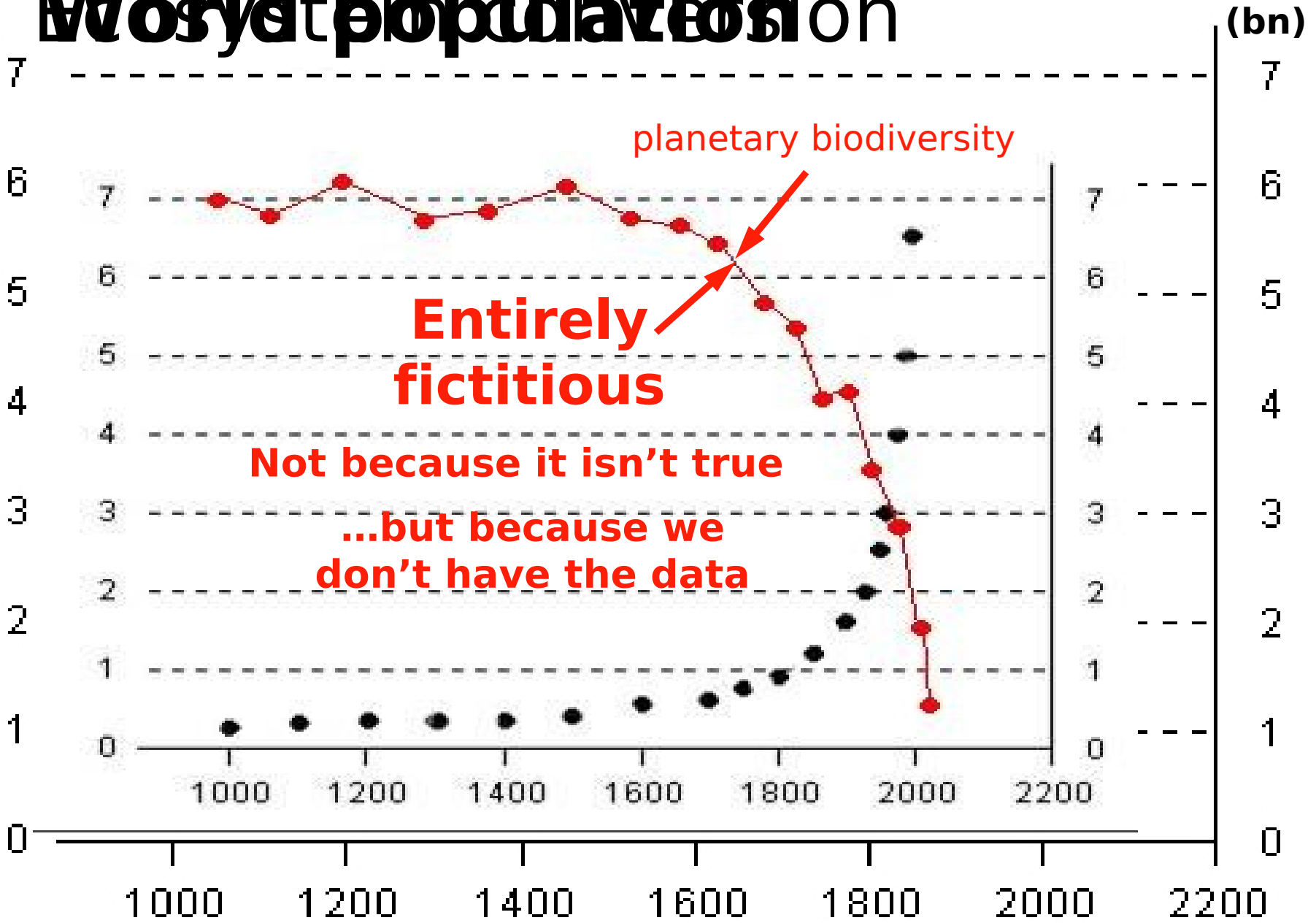
Fisheries
Fisheries
• Removal of
• top predators
• edible species
• “commercial extinction”
Pauly, Daniel (2003).
Ecosystem impacts of the world's marine fisheries.
Global Change Newsletter, 55, page 21

Planetary impact

- Import well-being, export ecological cost
- Economic colonisation
  - Globalisation
  - Trade
  - Tourism
  - Business practices
- Cost to living world
  - Biological homogenisation
  - Non-indigenous invasive organisms
  - Emergent diseases
  - Rapid, massive habitat conversion

World population

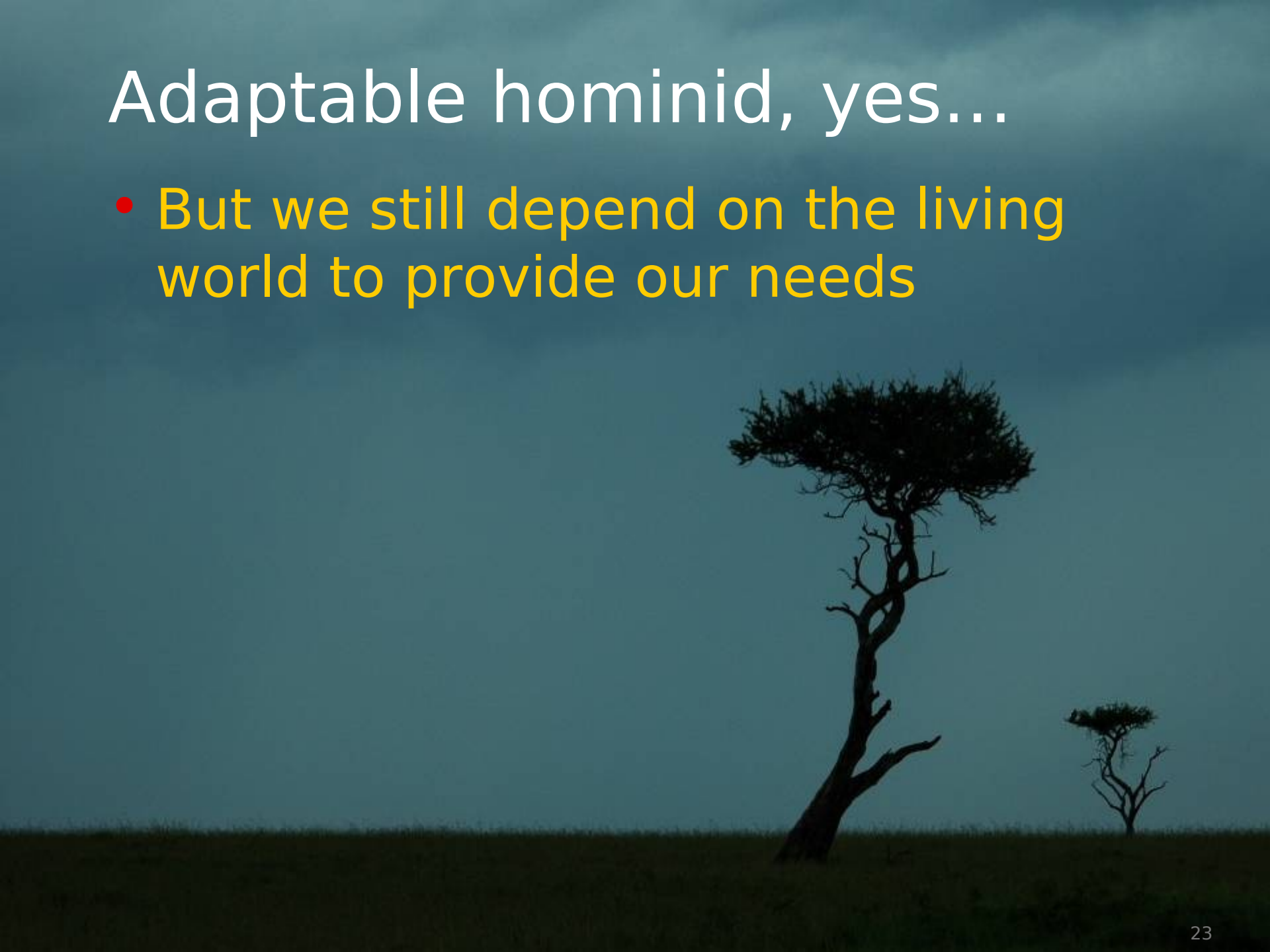


Rapid loss of life on Earth

- Holocene extinction event
  - 6th global extinction in 450 million years (m.y.)
- each wipes out 50 to 95% of species
  - last one, 65 m.y. ago, removed dinosaurs
    - will we survive our own Holocene extinction?
- takes 10 to 20 m.y. to restore diversity
- a sustainable future for us depends on sustaining some components or aspects of biodiversity
  - which ones?
  - is it enough to establish protected areas?
  - is it enough only to conserve species of economic interest to us?

Adaptable hominid, yes...

- But we still depend on the living world to provide our needs



the living world...

- Gives us
  - oxygen, food, fibre, medicine, fuel
- Ensures that
  - water and air are pure, plants are pollinated, seed are dispersed, pest and disease controlled
- Helps to
  - dispose of waste, recycle nutrients, regulate floods, absorb carbon, regulate climate
- Allows us to be human, giving us
  - inspiration, recreation, well-being, discovery
- Provides options for the future
  - choice for future generations, buffer against the unexpected

we change our planet by…

- Producing and consuming without concern for sustainability
  - Hunting more quickly than nature can replace
  - Harvesting more quickly than nature can provide
- Changing habitats, disrupting ecosystems
- Breaking up habitat or joining habitats that were separate
- Changing what genes are available
- Introducing species from other places
  - Making everywhere biologically similar
  - Giving opportunities to non-indigenous invasive organisms
- Giving opportunities for new and re-emergent diseases
- Encouraging loss of soil
- Polluting air, soil, water
- Exporting damage elsewhere
- Provoking climate change

Loss of species
Loss of key functional groups
(such as pollinators)

Loss of nature's capacity
to look after us

Effects of climate change

- oceans warm up
  - corals bleach and die
- spring arrives earlier, winters milder
  - growing season lengthens
    - agriculture shifts
    - increased agricultural yields in Northern and Eastern Europe
- climates move
  - tundra and taiga shrink
  - Mediterranean warmer, drier, desert-like
  - sub-tropical climates migrate towards poles
  - tropical climates too hot and dry for agriculture
- ecosystems change rapidly
  - plants and animals migrate to cooler places or die
- disease spreads from tropics

Strong interaction with other causes of change

Most important reason to be worried about climate change: its impact on the living world

What causes these things?

- Nobody wants ecological disaster
- Most people behave legally
- Billions of us need to
  - Eat
  - Stay warm
  - Find shelter
  - Dispose of waste
- Many of us want to
  - Get richer (the profit motive)
- Billions of legal actions every hour
  - Nibbling away at our world

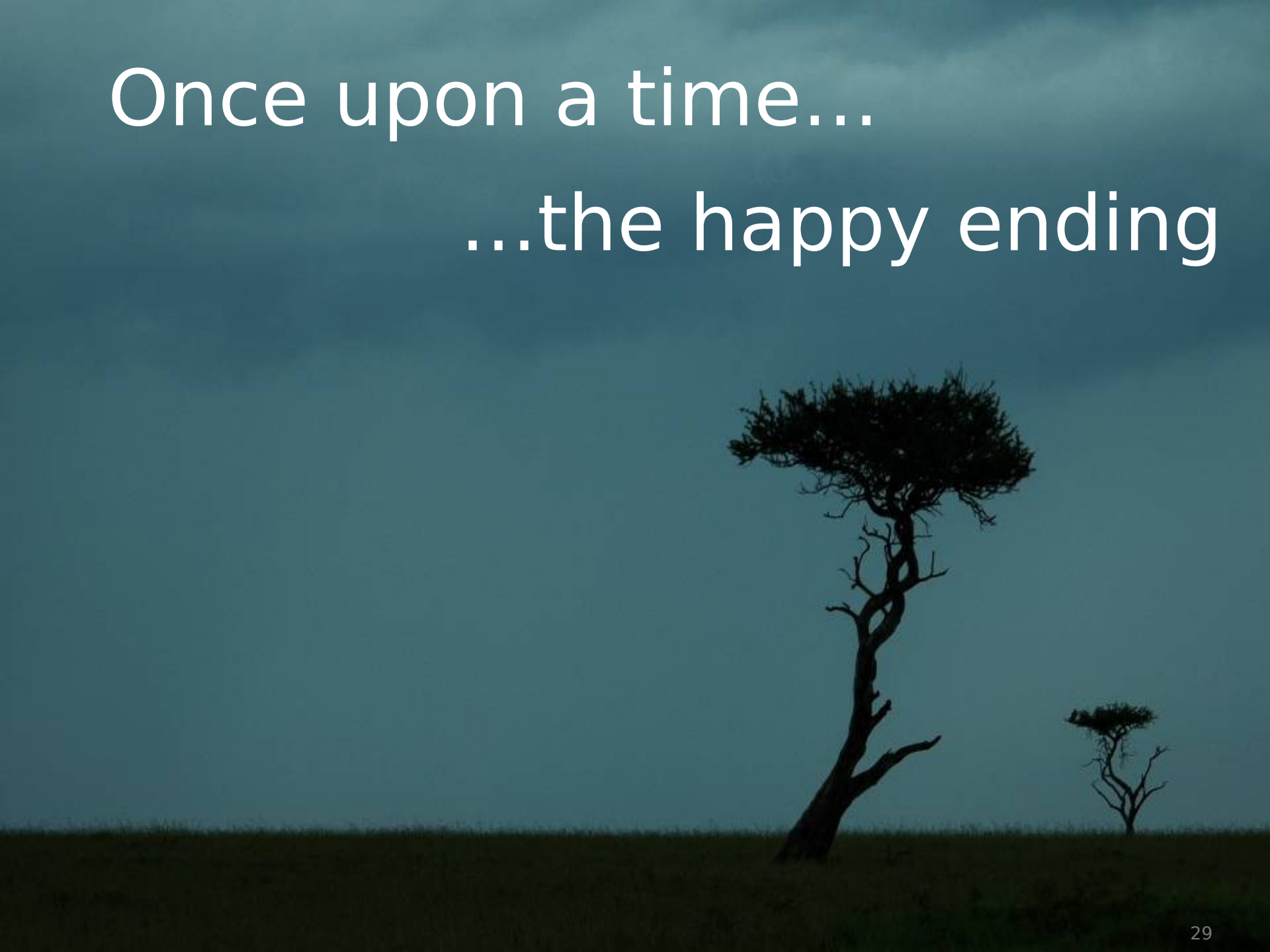
this is our story

- There is no “right” answer
  - Not as simple as “more CO_2 is bad”
  - Many happy endings are possible
  - Many unhappy endings, too
- No species has a right to exist
  - Not even *Homo sapiens*
- We need the living world
  - The living world does not need us
- The future is a choice of society
  - Not to choose is to choose collapse

the Holocene hominid suicide

Once upon a time...

...the happy ending



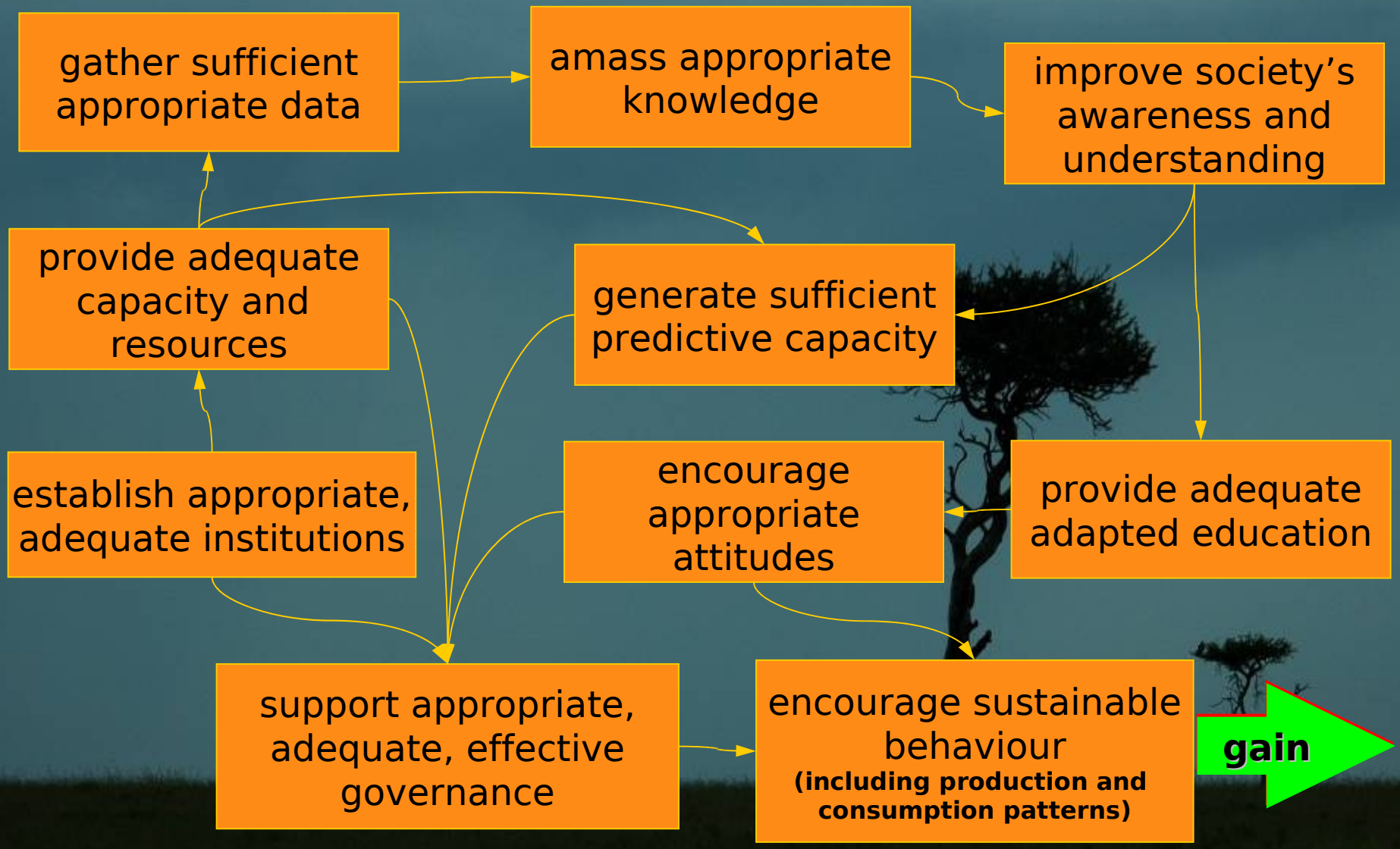
Controlling change

- “Billions of legal actions …”
- Each one of us can do something
  - Individuals
  - Educators
  - News and information media
  - Civil Society Organisations
  - Businesses
  - Policy makers and administrators
  - Government

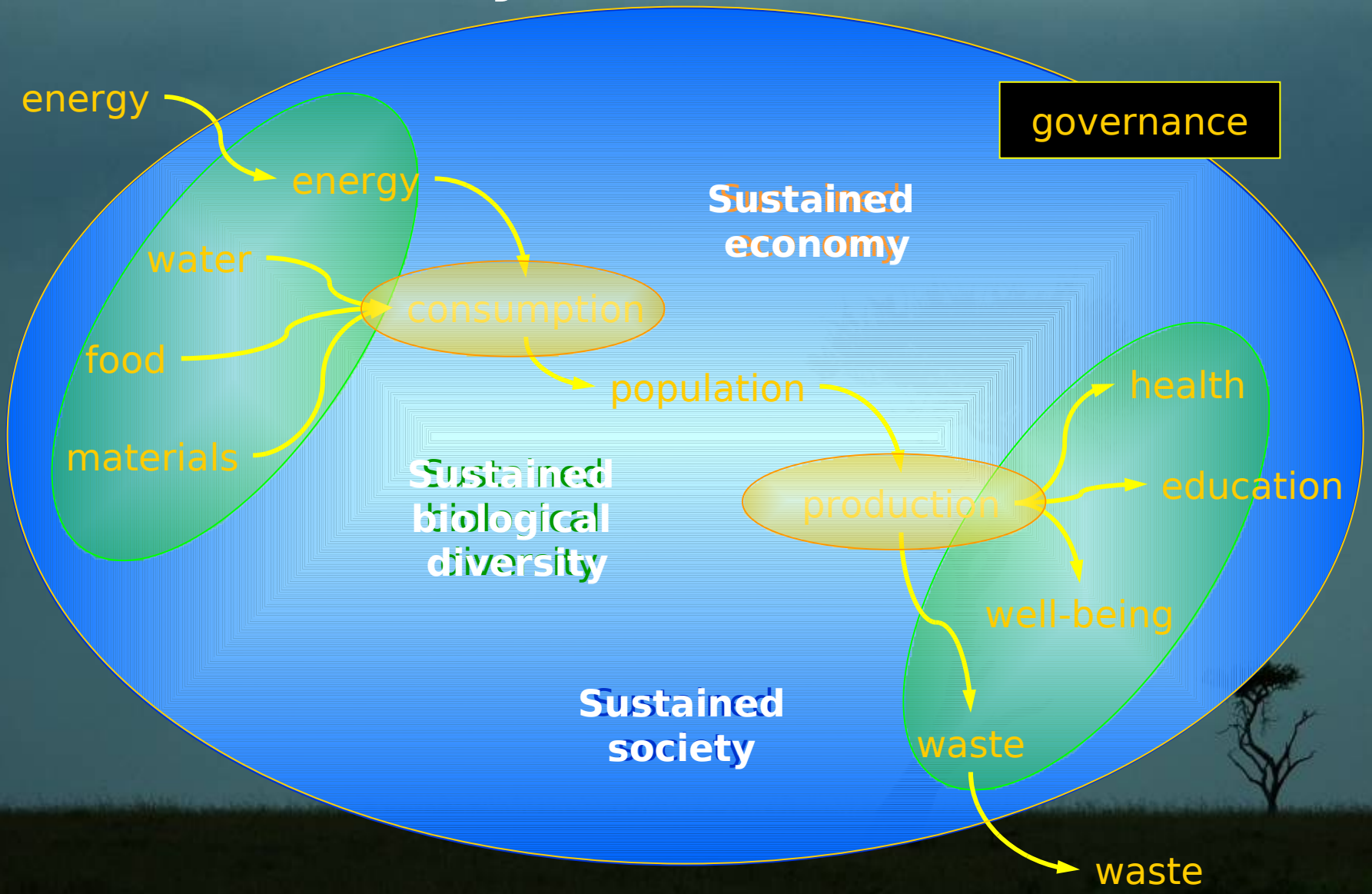
Communication, action

- Conscience
  - see that humans are part of a living whole
  - concentrate ingenuity onto resolving problem
- Stewardship
  - think of the future, then chose wisely
  - abstain from actions that harm biodiversity
- Discipline
  - consume with awareness and moderation
  - consume local produce, in season
- Effort
  - without effort, nothing can be achieved

what can we do?



the society cell



Life tomorrow

- Resources
  - Water — clean, multi-purpose, adequate
  - Food — healthy, adequate
  - Energy — low or no environmental cost, adequate
  - Waste — limited, controlled, recycled
- Society
  - Population — stable, small
  - Governance — responsive, co-operative, peaceful
  - Health — good, disease contained
  - Education — rounded, adapted, universal
  - Well-being — high
- Economy
  - Production — rational, adequate, sustainable
  - Consumption — rational, reasonable , local, sustainable

The Cheshire Cat

Alice came to a fork in the road. "Which road do I take?" she asked.

"Where do you want to go?" responded the Cheshire cat.

"I don't know," Alice answered.

"Then," said the cat, "it doesn't matter."

"So long as I get *some*where," Alice added as an explanation.

"Oh, you're sure to do that," said the Cat, "if you only walk long enough."