

The Environmental History of Humans

Seminar material for students in
Regional and Environmental Economics MA,
John von Neumann University

By Professor Dr. István Tózsá,
supported by Gemini AI,
2026

Seminar Text for Slide **1** (Introduction).

Ladies and Gentlemen, Distinguished Students,

This seminar material explores the deep environmental history of human evolution through the lens of regional and environmental economics.

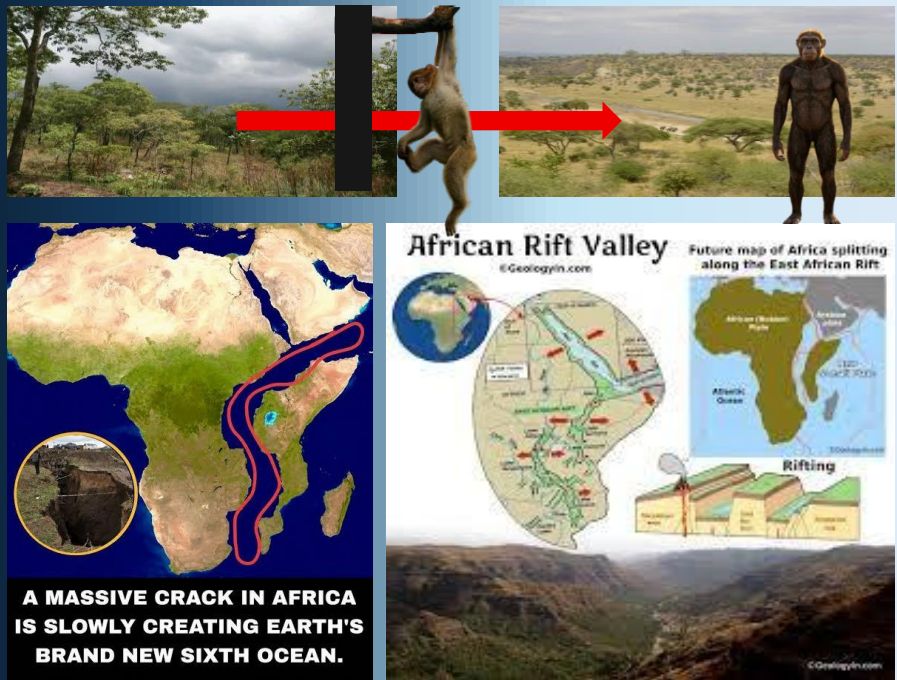
Throughout the Pleistocene, hominin development was not merely a biological process, but a series of adaptive economic responses to severe environmental externalities and shifting carrying capacities.

Drastic climate fluctuations forced our ancestors to constantly reallocate resources, innovate primitive capital goods, and migrate across territorial borders.

By analysing these ancient ecological constraints, students will understand how macro-environmental shocks shaped the structural foundations of human resource management, paving the way toward the anthropocentric environmental crises of the modern era.

The Cradle of Humans

East African Rift Valley



Regional allocation of resources: tectonic shift from primeval forest to savanna

Seminar Text for Slide 2 (The Cradle of Humans)

This slide illustrates the critical role of tectonic externalities in forcing the earliest hominin resource reallocation.

The tectonic uplifting along the East African Rift Valley created a massive orographic barrier, blocking oceanic air masses and causing severe aridification in the region.

As the continuous primeval forest fragmented into an open savanna, tree-dwelling primates experienced an unprecedented habitat loss.

To survive this environmental shock, they were forced to adopt bipedalism, descending to the ground where they faced intense predatory pressure.

This precise combination of factors – the presence of highly evolved primates, apex predators, and a rapidly transforming landscape – constituted a unique regional resource layout that existed nowhere else on Earth, triggering the first 'smart' behavioural adaptations and evolutionary innovations in human history.

THE ANCESTORS

Proconsul

lived from 21 to 17
million years ago



Pithecus

lived from 4.2 to
1.9 million years ago



Market diversification: getting off the tree to minimize opportunity cost of survival.

Seminar Text for Slide 3 (The Ancestors)

This slide traces the structural roots of hominoid divergence through macro-evolutionary timelines. *Proconsul*, existing from **21 to 17 million years ago**, represents the earliest tail-less hominoid; its name historically refers to 'Consul', a famous performing chimpanzee of the London Zoo.

Proconsul engaged in early **market diversification** by transitioning from strict arboreal life to partial ground-dwelling.

By **4.2 to 1.9 million years ago**, the *Australopithecus* ('Pithecus') lineages achieved an **ecological arbitrage**.

Facing a fragmented African landscape, these hominins treated physical migration as a spatial investment to minimize the **opportunity cost** of local resource depletion.

Their geographic expansion out of the primary core zones demonstrates the earliest spatial and demographic distribution models driven by regional environmental pressures.

Rudapithecus hungaricus lived 10 million years ago



Seminar Text for Slide **4** (Rudapithecus hungaricus)

This slide introduces a local paleoenvironmental milestone of global significance: *Rudapithecus hungaricus*, which thrived **10 million years ago** in the subtropical, swampy ecosystem of ancient Rudabánya.

Discovered in a former iron ore quarry, this hominid represents a scientific sensation. In 2019, researchers analysed its partial pelvis – the only reasonably complete ape pelvis in the world older than 4 million years.

From an environmental economics perspective, the *Rudapithecus* pelvis displays early anatomical investments toward orthograde posture and potential bipedalism, long before the African ecological divergence.

This ancestral trait can be modelled as a physiological **path dependency**. It shows that the structural adaptations required to exploit transitional forest-aquatic boundaries were already present in the Late Miocene European climate corridor, framing Hungary as a foundational region in prehistoric habitat shifts.

THE FIRST HUMANS

Homo habilis

lived from 2.4 to 1.4
million years ago

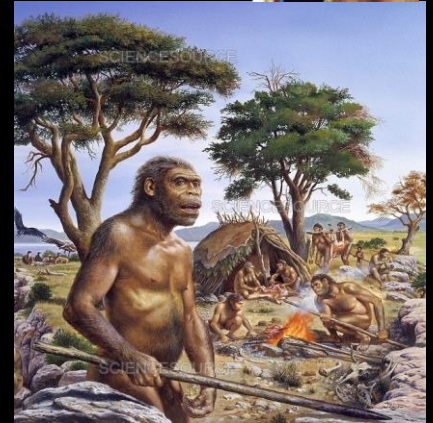


Homo erectus

lived from 1.9 million
to 110 000 years ago



Portfolio diversification: stone axe of the habilis



Seminar Text for Slide **5** (The First Humans)

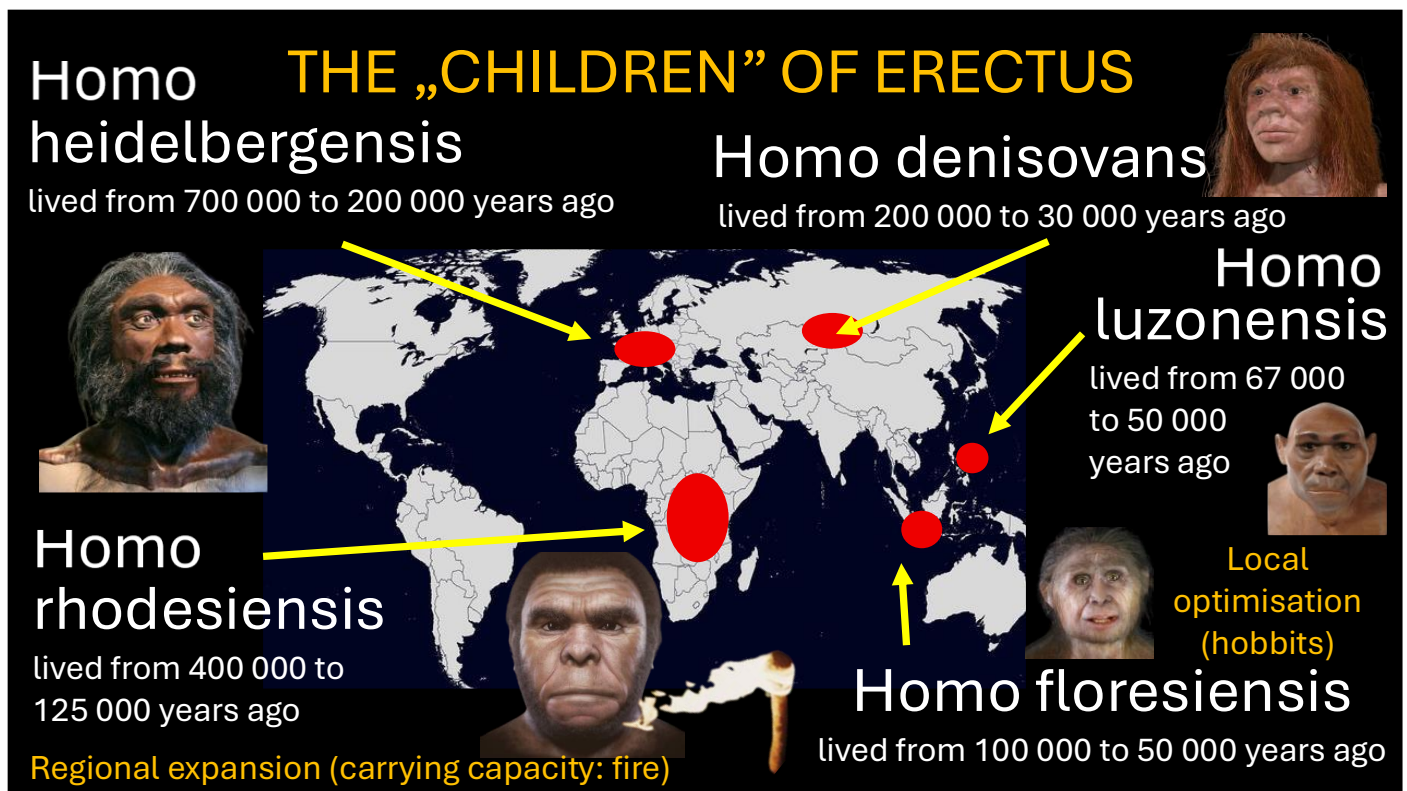
This slide marks the emergence of the genus *Homo* and the initiation of large-scale hominin spatial expansion.

Homo habilis, existing from **2.4 to 1.4 million years ago**, pioneered early technological **portfolio diversification** through the fabrication of primitive stone tools.

However, due to its localized resource dependence, *Homo habilis* remained restricted to the African core. Conversely, *Homo erectus* (**1.9 million to 110,000 years ago**) achieved a massive macroeconomic breakthrough by internalizing the control of fire and developing the Acheulean handaxe – an inherited technological **capital good**.

This technological endowment drastically reduced the species' dependence on local climate constraints.

By transforming environmental barriers into transport corridors, *Homo erectus* successfully managed external shocks, initiated the first intercontinental migration toward Eurasia, and expanded the geographical **carrying capacity** of the early human economy.



Seminar Text for Slide 6 (The "Children" of Erectus)

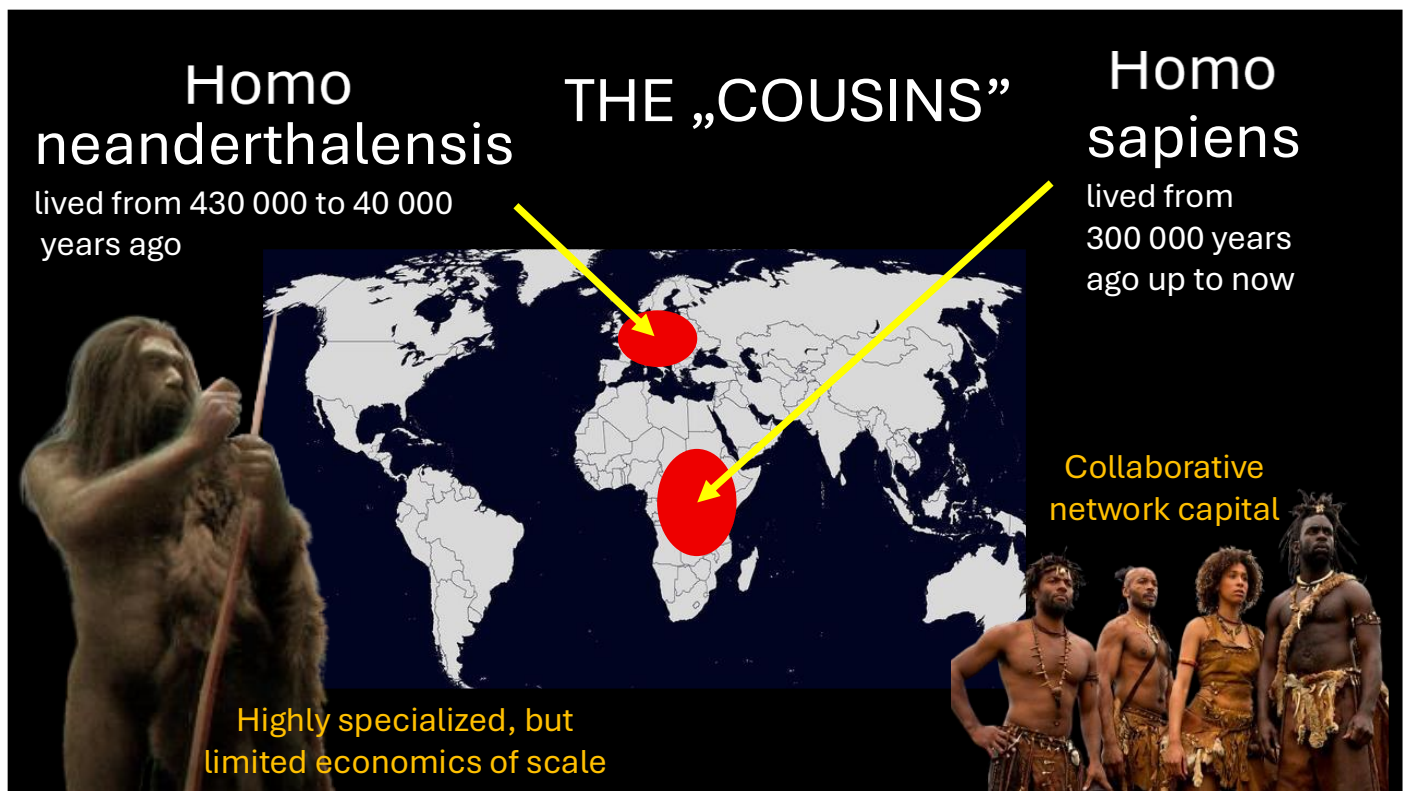
This slide illustrates the diversification of *Homo erectus* lineages as a function of regional environmental constraints and varying carrying capacities.

As populations settled into distinct geographic zones, global climate shocks forced diverse economic-evolutionary pathways. In temperate and continental Eurasia, *Homo heidelbergensis* and the *Denisovans* invested in physiological adaptations to mitigate the negative externalities of glacial climates.

Conversely, in the geographically isolated maritime ecosystems of Southeast Asia, *Homo floresiensis* and *Homo luzonensis* faced severe territorial boundaries.

Under strict island resource constraints and a fixed carrying capacity, these 'hobbit' species underwent insular dwarfism.

This evolutionary response represents a highly successful **local micro-optimisation** strategy, minimizing baseline caloric maintenance costs to maximize long-term demographic survival in a closed economy.



Seminar Text for Slide **7** (The "Cousins")

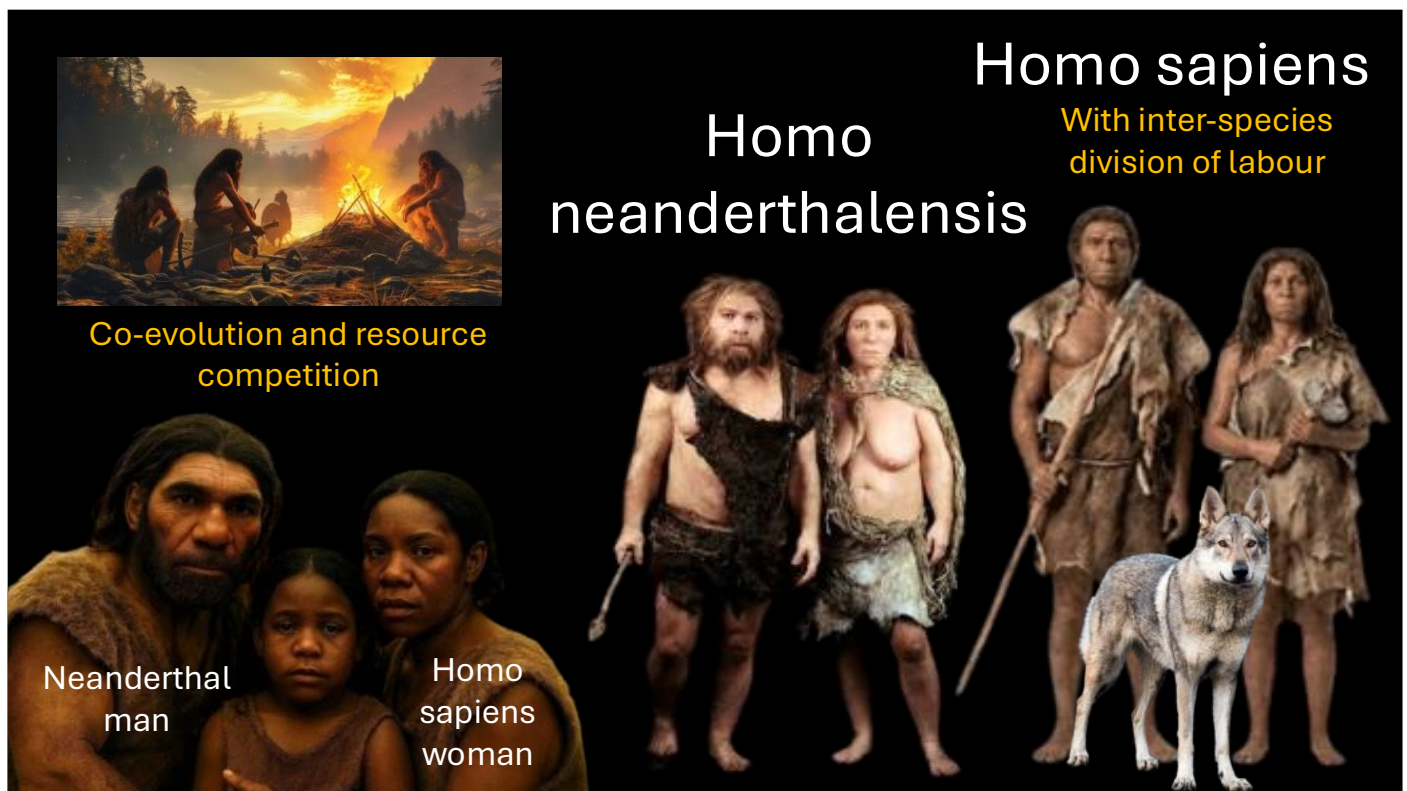
This slide analyses the comparative structural frameworks of the two most successful late hominin species prior to their major territorial overlap.

Homo neanderthalensis, existing from **430,000 to 40,000 years ago**, achieved superb physical optimization for the harsh Eurasian glacial environments. They were robust, highly efficient apex predators; however, their socio-economic structures lacked **economies of scale**.

Neanderthals operated in isolated, family-sized units with limited linguistic differentiation, restricting their regional social capital. Conversely, *Homo sapiens* emerged roughly **300,000 years ago** in Africa with a radically different organizational model.

By investing heavily in complex vocal communication and macro-social scaling, early modern humans lowered internal transaction costs and facilitated larger tribal structures.

While the Neanderthal model excelled in localized, short-term resource extraction, the *Homo sapiens* strategy prioritized collaborative **network capital**, establishing a highly flexible foundation for long-term demographic resilience.



Seminar Text for Slide **8** (The Overlap: Competition and Assimilation)

This slide analyses the direct regional competition and hybridization between *Homo sapiens* and *Homo neanderthalensis* in western Eurasia.

Structurally, Neanderthals possessed a robust, cold-adapted physique with superior localized hunting capabilities. However, *Homo sapiens* outcompeted them during the Last Glacial Maximum through critical biological and technological externalities.

A decisive factor was the domestication of the wolf – an early **inter-species division of labour** unique to *Homo sapiens* sites. Canid cooperation enhanced hunting efficiency and reduced caloric search costs, tilting the ecological equilibrium.

As *Homo sapiens* expanded, the Neanderthal population experienced habitat fragmentation and competitive exclusion. This encounter was not merely destructive, but assimilative: modern non-African human genomes retain approximately **2% Neanderthal DNA**, proving that resource competition was accompanied by complex demographic integration.



THE „WINNER” Homo sapiens

Global and cognitive resilience



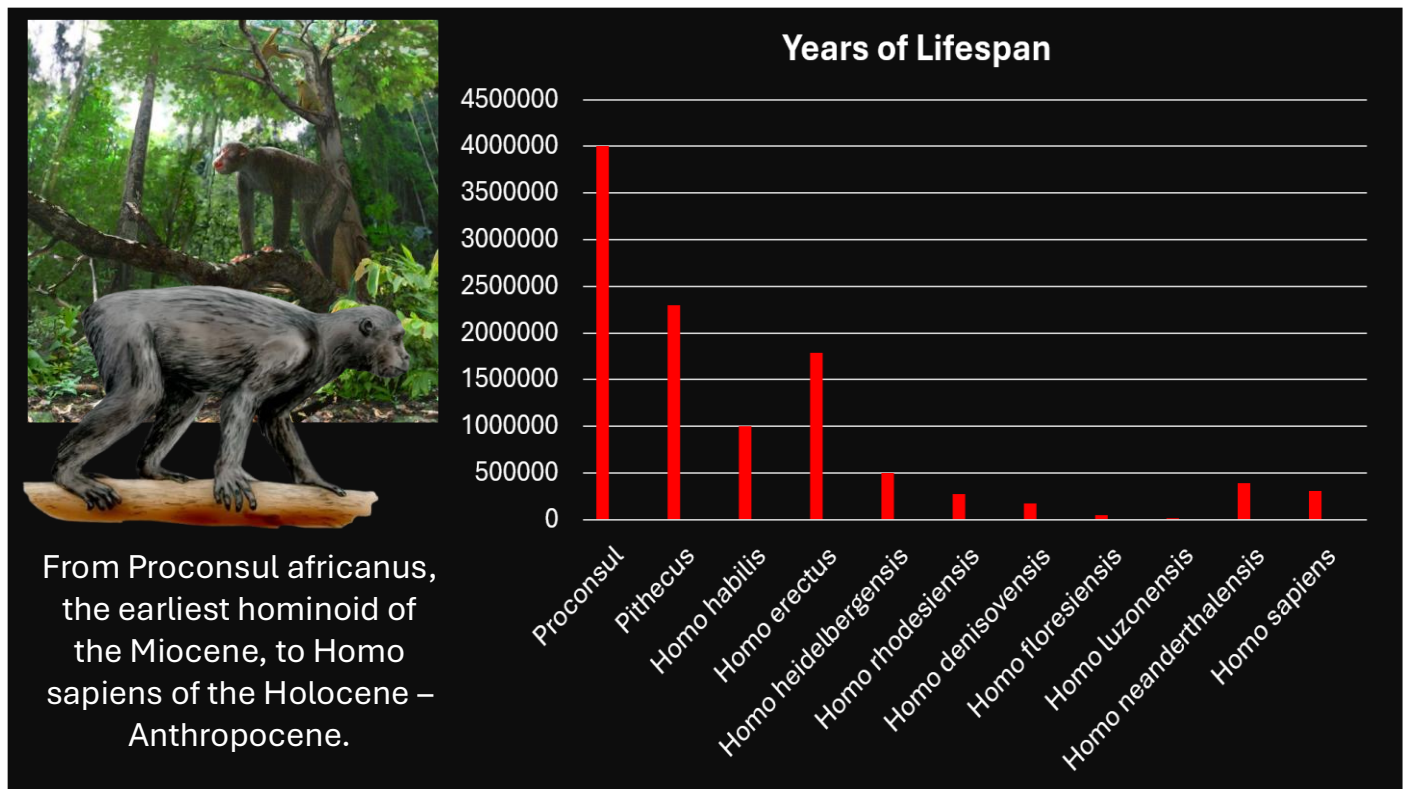
Seminar Text for Slide **9** Global Migration and Spatial Monopoly

This slide illustrates the out-of-Africa migration and the subsequent global expansion of *Homo sapiens*, cementing their position as the ultimate ecological 'winner'.

Initiated approximately **70,000 years ago**, this migration can be modelled as a macro-scale risk diversification strategy. Armed with unmatched **cognitive resilience**, modern humans did not adapt to specific local ecosystems physically; instead, they altered their behaviour through cultural and technological innovations.

This flexible asset allowed *Homo sapiens* to colonize radically diverse climatic zones within a remarkably short evolutionary window, reaching Australia by **65,000 years ago** and the southernmost tips of South America by **15,000 years ago**.

By establishing a global spatial monopoly, *Homo sapiens* successfully scaled their demographic carrying capacity, effectively removing all geographical boundaries to resource exploitation and setting the stage for the Anthropocene.



Seminar Text for Slide **10** Systemic Acceleration of Hominin Turnover

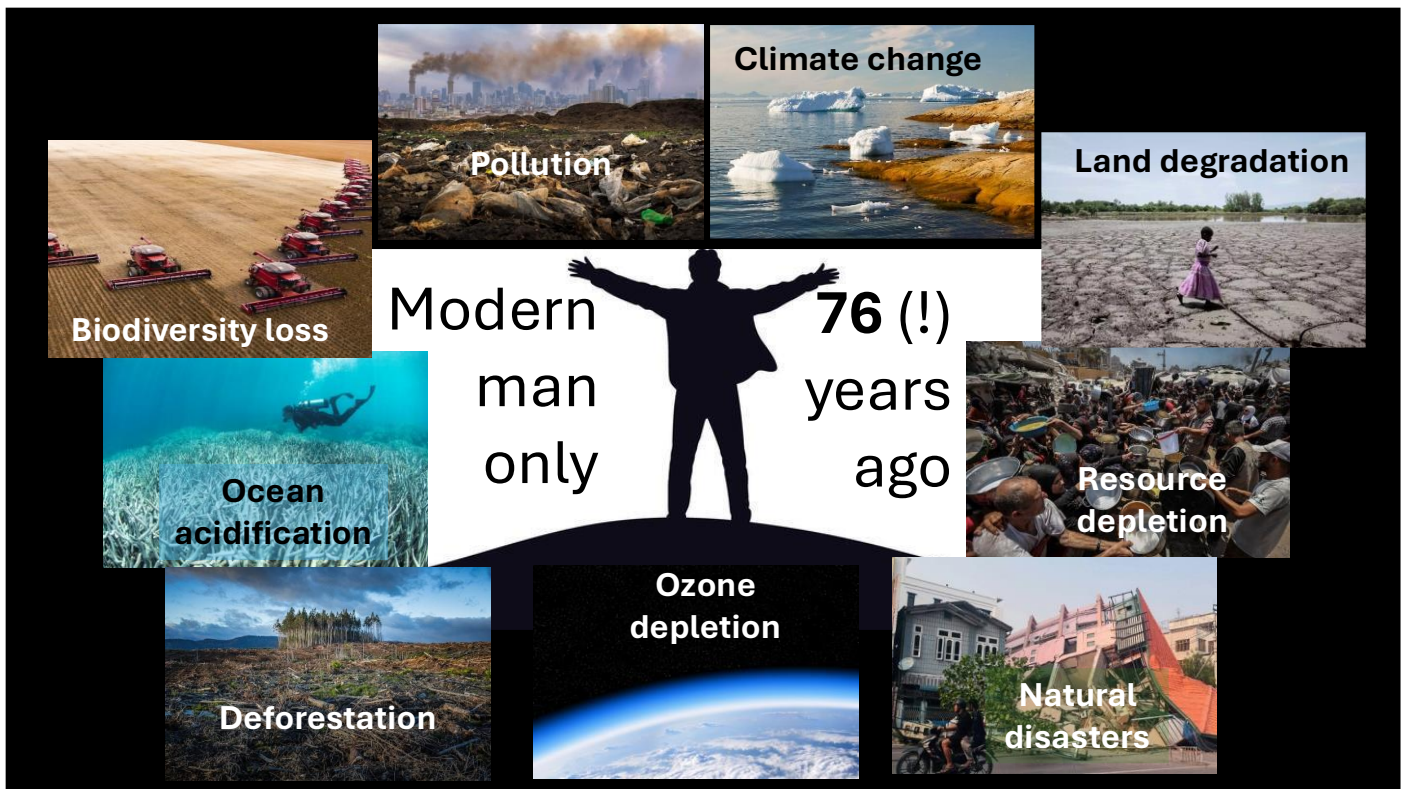
This diagram illustrates a fundamental macro-evolutionary phenomenon: the systemic acceleration of hominin turnover and the progressive shortening of species lifespans over geological time.

Much like geological eras, early lineages such as *Proconsul* and *Australopithecus* sustained equilibrium for millions of years due to low-intensity resource extraction and high environmental passivity.

As cognitive capacities and technological capital intensified – from *Homo erectus* down to the *Denisovans* and *Neanderthals* – the duration of species survival drastically contracted. (The hyper-short lifespans of *Homo luzonensis* and *Homo floresiensis* remain regional anomalies driven strictly by isolated island carrying capacities).

The ultimate paradox rests with *Homo sapiens*: despite having the relatively shortest evolutionary lifespan of just 310,000 years, our exponential technological growth has broken all stabilizing feedback loops.

This rapid temporal compression creates the modern crisis: the shortest-lived species poses the most lethal systemic threat, destabilizing the global environment faster than the biosphere can structurally adapt.



Seminar Text for Slide **11** (The Anthropocene and the Great Acceleration)

This final slide establishes a critical historical and economic baseline for the course, introducing the concept of the Anthropocene.

While the structural roots of environmental disruption trace back to the Industrial Revolution around 1780, the truly critical turning point occurred in 1950 – exactly **76 years ago**.

This mid-20th-century threshold marks the onset of the **Great Acceleration**, characterized by an exponential surge in global population, fossil energy consumption, and industrial output.

Within this incredibly narrow 76-year window, modern socioeconomic systems converted from adaptive entities into a dominant geological force.

This slide introduces Johan Rockström's framework of **Planetary Boundaries**, highlighting nine severe global threats, including climate change, biodiversity loss, and ocean acidification.

These compounding crises represent massive, anthropocentric systemic failures where economic externalities violently breach the biophysical boundaries of our planet, fundamentally destabilizing the modern biosphere.