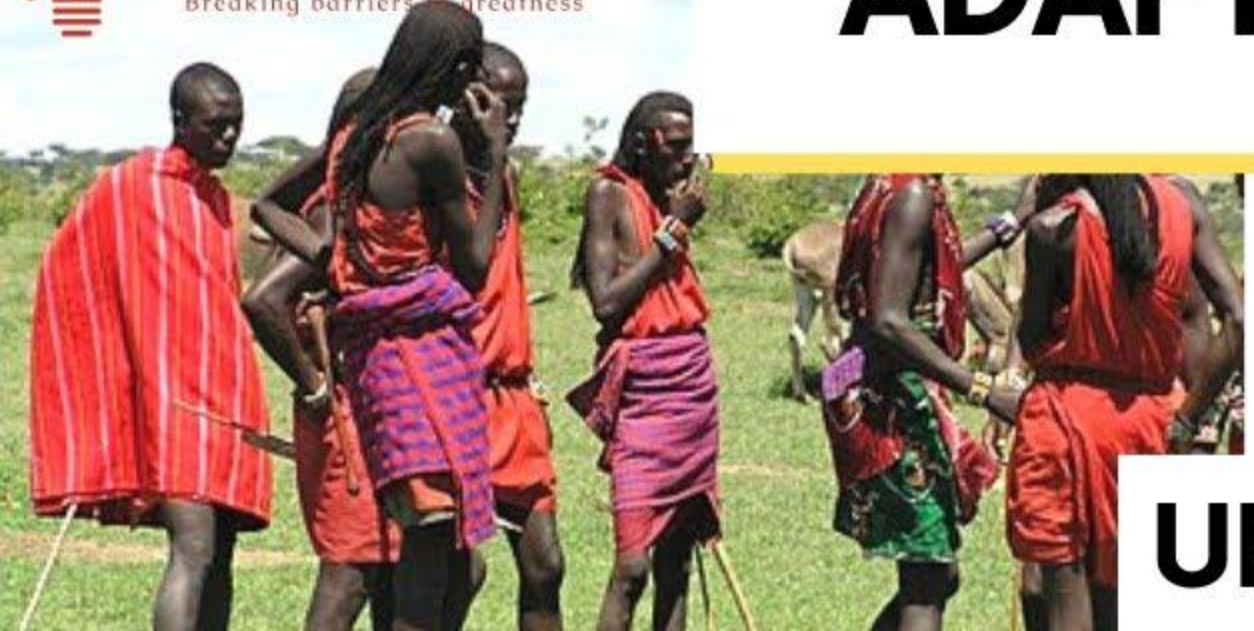
MEDICAL ACADEMY NAMED AFTER S.I. GEORGIEVSKY OF VERNADSKY CFU

NON-SPECIFIC HUMAN ADAPTATION

Submitted By:
Gupta Sneha
195 B

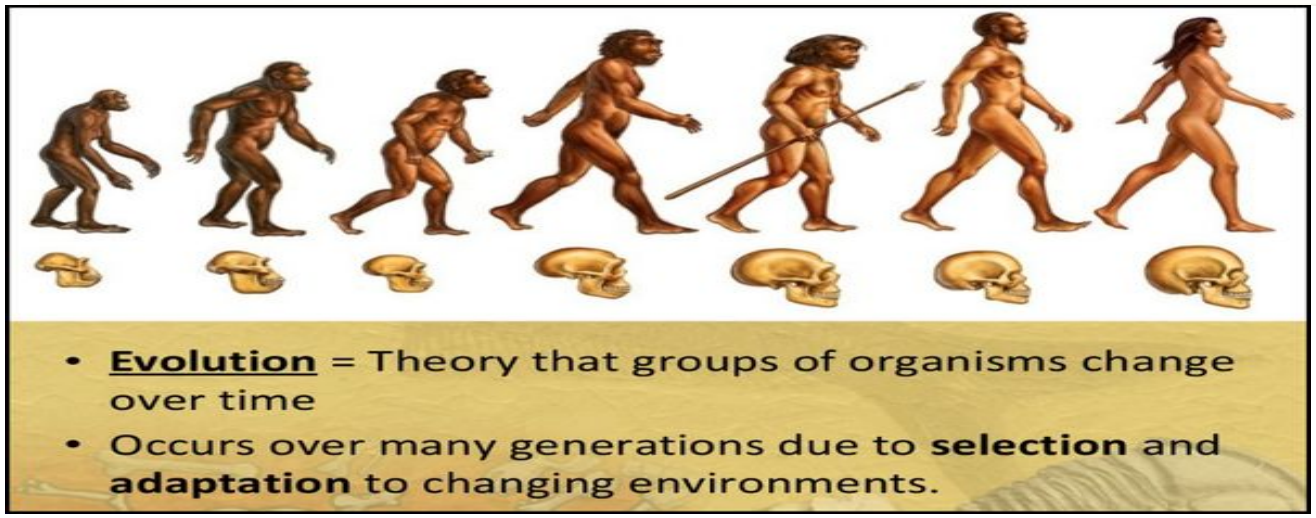
Guided By:
Anna Zhukova
Mam

HUMAN ADAPTATION



UPSC ANTHROPOLOGY

ADAPTATION



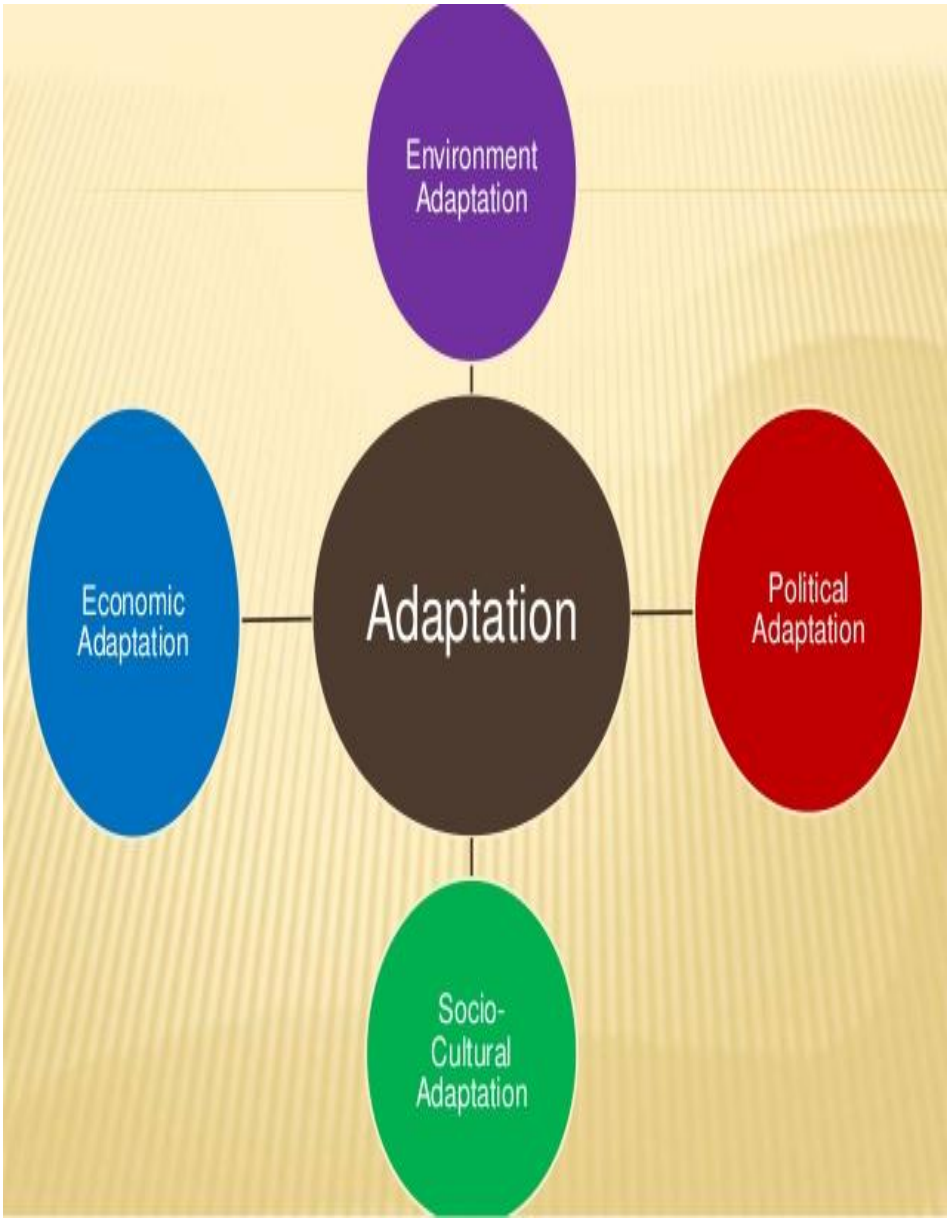
MEANING OF ADAPTATION

Derived from Biology a process that takes place under natural section whereby an organism becomes better suited to its habitat.

In sociology, It refers to some characteristics which stand out as being especially significant in the survival of an individual in society.

What are adaptations?

Adaptations – an inherited characteristic that helps an organism to *survive* long enough to *reproduce* more successfully in its changing environment and can either be structural or behavioral



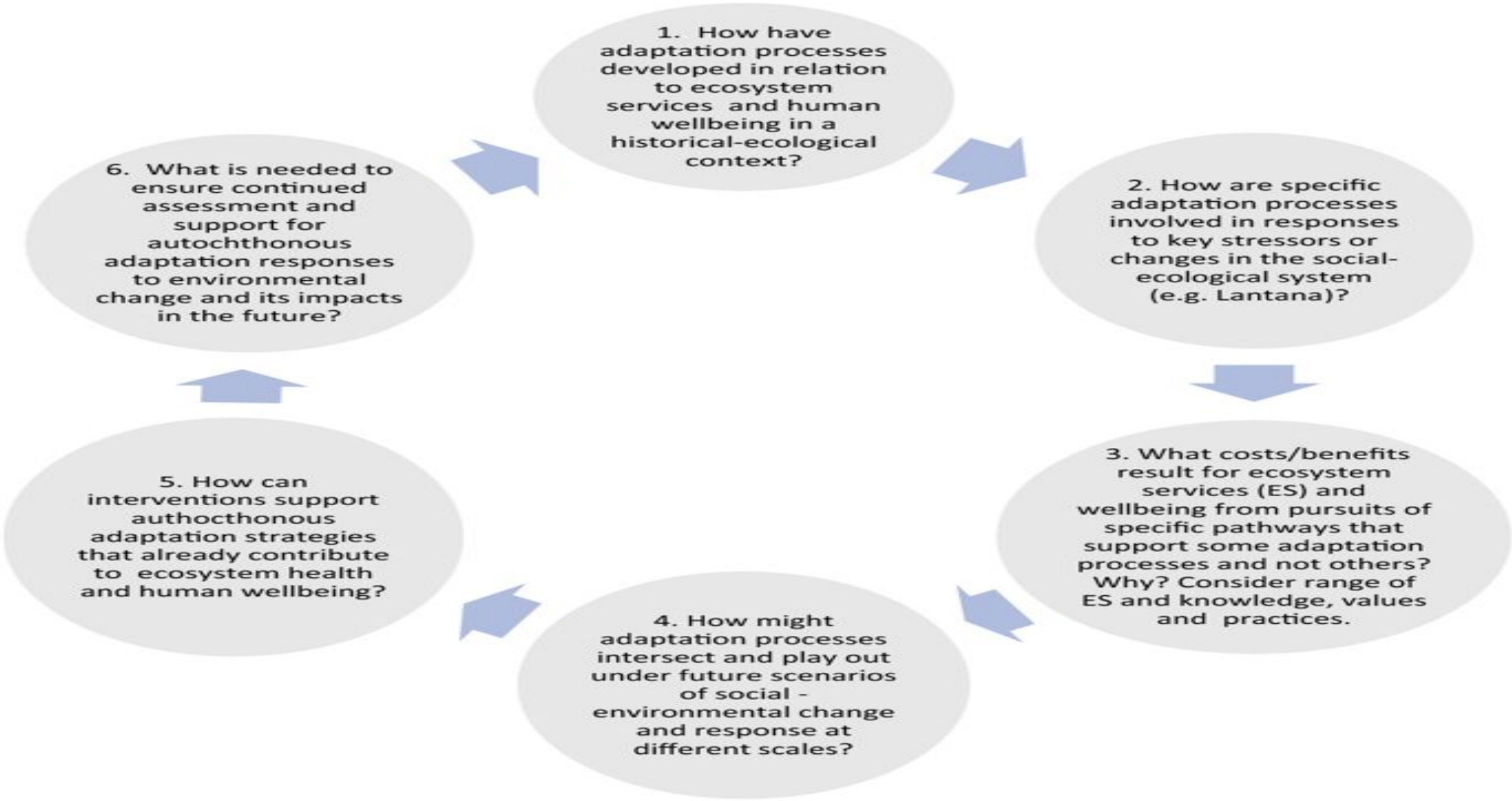
DEFINITION OF ADAPTATION

"**Adaptation** refers to changes that occur in order to maintain various aspects of a social system's culture or structure or to aid in survival." **By Ashely Crossman**

Adaptation refers to change in structure, function or behavior by which a species or an individual improves its chance of survival in a specific environment.

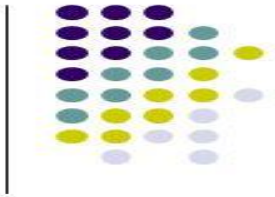
CHARACTERISTICS OF ADAPTATION

- **Universal and dynamic in nature**
- **Continuous process**
- **Flexibility**
- **Social learning**
- **Adjustment**


1. How have adaptation processes developed in relation to ecosystem services and human wellbeing in a historical-ecological context?
2. How are specific adaptation processes involved in responses to key stressors or changes in the social-ecological system (e.g. Lantana)?
3. What costs/benefits result for ecosystem services (ES) and wellbeing from pursuits of specific pathways that support some adaptation processes and not others? Why? Consider range of ES and knowledge, values and practices.
4. How might adaptation processes intersect and play out under future scenarios of social - environmental change and response at different scales?
5. How can interventions support authocthonous adaptation strategies that already contribute to ecosystem health and human wellbeing?
6. What is needed to ensure continued assessment and support for autochthonous adaptation responses to environmental change and its impacts in the future?

nonspecific

1st Line of Defense
External Barriers
(non-specific)



- External barriers are **non-specific**, meaning they will work to keep out all foreign invaders
- **The human skin**, if unbroken, forms an almost impenetrable barrier against microorganisms
- Cells in the nasal passages and pharynx secrete sticky **mucus** that traps microorganisms and digestive enzymes in the mucus can destroy most microorganisms
- The **stomach** also contains strong acid and enzymes that can kill pathogens

possible endurance running adaptations in human

*arguments for the **endurance running hypothesis***

*species: **Homo sapiens & archaic Homo***

*proposed natural habitat: **forest-grassland mosaic***

- human performs well at **endurance running** compared to other primates ①
- enables **persistent hunting** & **strategic scavenging** ①②
- wider **range of running speeds** as upright body decoupled respiration from running gait ①③

thermoregulation

respiration

energetics

stabilization (head)

stabilization (body)

skeletal strength

expanded venous circulation in the braincase cools the head via **countercurrent heat exchange** ①

tightly coiled hair impedes UV radiation ④

scalp hair blocks sunlight ④

tall, narrow body form helps cool down the body ①

dark skin pigment blocks sunlight in tropical open grasslands ④

eccrine sweating with **reduced body hair** dissipates heat via evaporation ①

more mouth breathing allows more efficient ventilation ①

enlarged semicircular canals (posterior & anterior) increase the sense of balance ①

improved vestibulo-ocular reflexes adjust eye movements to stabilize images ②

short snout & **neck ligament** stabilizes the head ①

loosen, low, wide shoulders with **decoupled head** help swinging of upper body to counter leg movements ①

shorter arms reduce effort in arm-swinging ①

tall, narrow waist allow greater counter rotation of the trunk ①

larger back & buttock muscles, stabilized spine-hip joint stabilize the trunk ①

expanded joint surfaces in lower body (spine, hip, legs) reduce stress in the skeleton ①

shorter femoral necks reduce bending stress ①

larger heel bones absorb shock ①

longer legs & **lighter feet** increase stride length with low stride rate, reduce energetic cost ①

larger thyroid & **adrenal glands** allow more efficient utilization of energy stores (carbohydrates, fats) ③

shorter toes decrease mechanical work ①

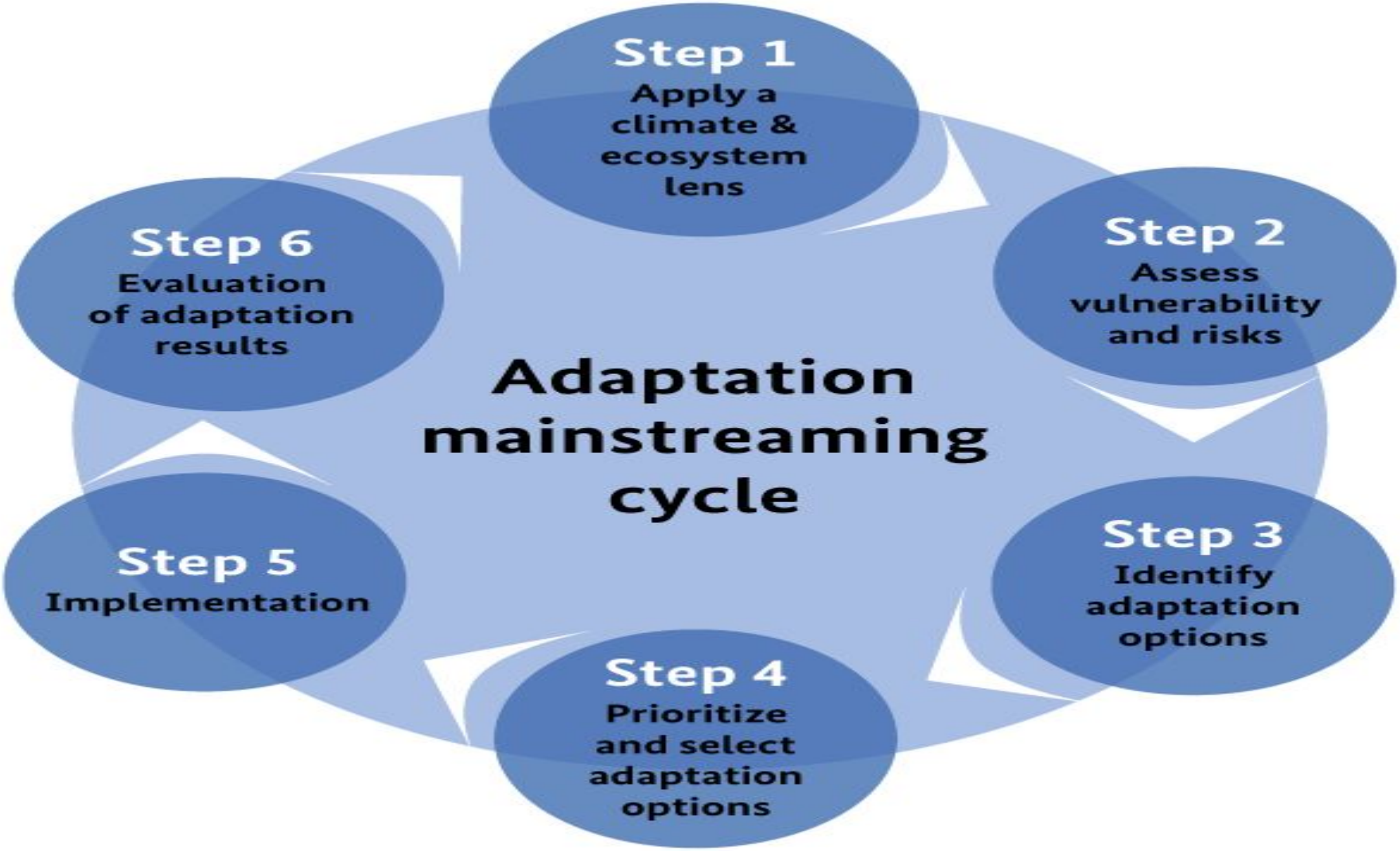
inward, projected big toe & **compacted mid-foot** restrict the rotation of feet ①

tendons & ligaments in legs act as springs to store & release elastic energy ①

well-developed **Achilles tendon** ①

foot arches act as springs to store elastic energy & absorb shock ①

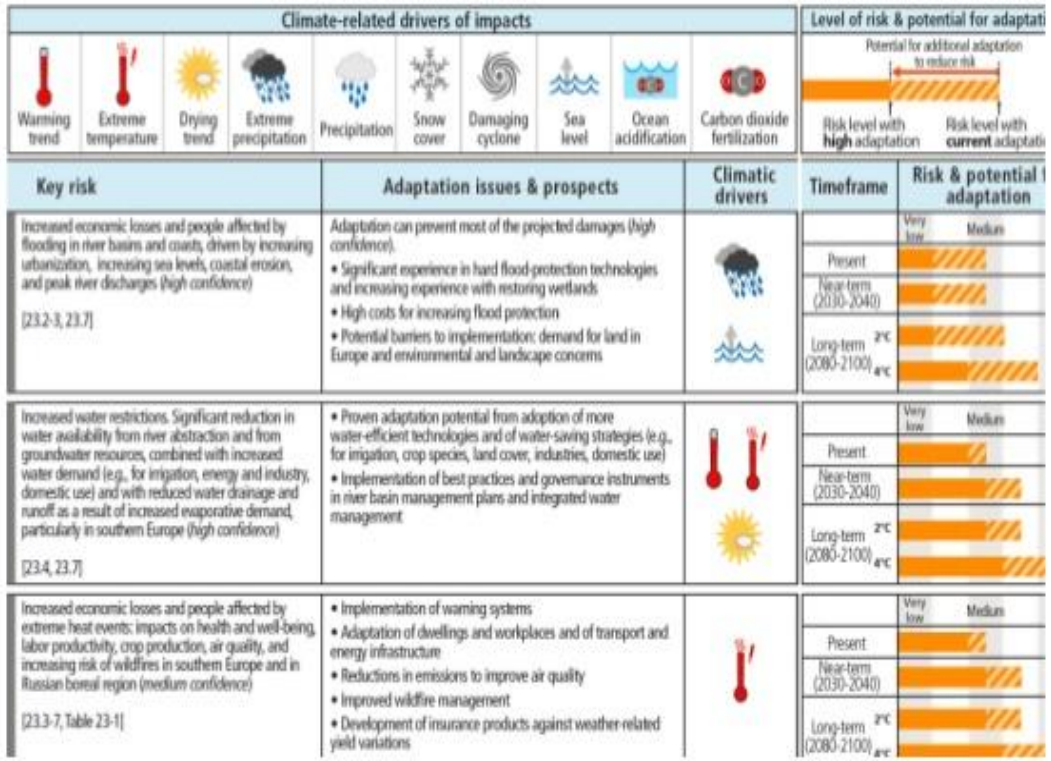
References: ❶ Bramble DM, Lieberman DE (2004) Endurance running and the evolution of Homo. *Nature* 432 (7015): 345–352 ❷ Lieberman DE, Bramble DM, Raichlen DA, Shea JJ (2009) Brains, Brawn, and the Evolution of Human Endurance Running Capabilities. In Grine FE *et al.* (eds.) *The First Humans: Origin and Early Evolution of the Genus* Homo: 77–92. Springer ❸ Carrier DR *et al.* (1984) The Energetic Paradox of Human Running and Hominid Evolution. *Current Anthropology* 25 (4): 483–495 ❹ Jablonski NG (2006) *Skin: a natural history*. University of California Press


Step 1
Apply a climate & ecosystem lens
Step 2
Assess vulnerability and risks
Step 3
Identify adaptation options
Step 4
Prioritize and select adaptation options
Step 5
Implementation
Step 6
Evaluation of adaptation results
Adaptation mainstreaming cycle

Sectoral Risks & Potential for Adaptation: Human Health

- Until mid-century, projected climate change will impact human health mainly by exacerbating health problems that already exist . Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income
- Examples include greater likelihood of injury, disease, and death due to more intense heat waves and fires; increased likelihood of under-nutrition resulting from diminished food production in poor regions; risks from lost work capacity and reduced labor productivity in vulnerable populations; and increased risks from food- and water-borne diseases and vector-borne diseases.
- The most effective adaptation measures for health in the near-term are programs that implement and improve basic public health measures such as provision of clean water and sanitation, secure essential health care including vaccination and child health services, increase capacity for disaster preparedness and response, and alleviate poverty

Regional Risks: Europe



Sectoral Risks & Potential for Adaptation: Human Security

- Climate change over the 21st century is projected to increase displacement of people.
- Displacement risk increases when populations that lack the resources for planned migration experience higher exposure to extreme weather events, particularly in developing countries with low income.
- Expanding opportunities for mobility can reduce vulnerability for such populations.
- Climate change can indirectly increase risks of violent conflicts in the form of civil war and inter-group violence by amplifying well-documented drivers of these conflicts such as poverty and economic shocks.

Sectoral Risks & Potential for Adaptation: Food Security

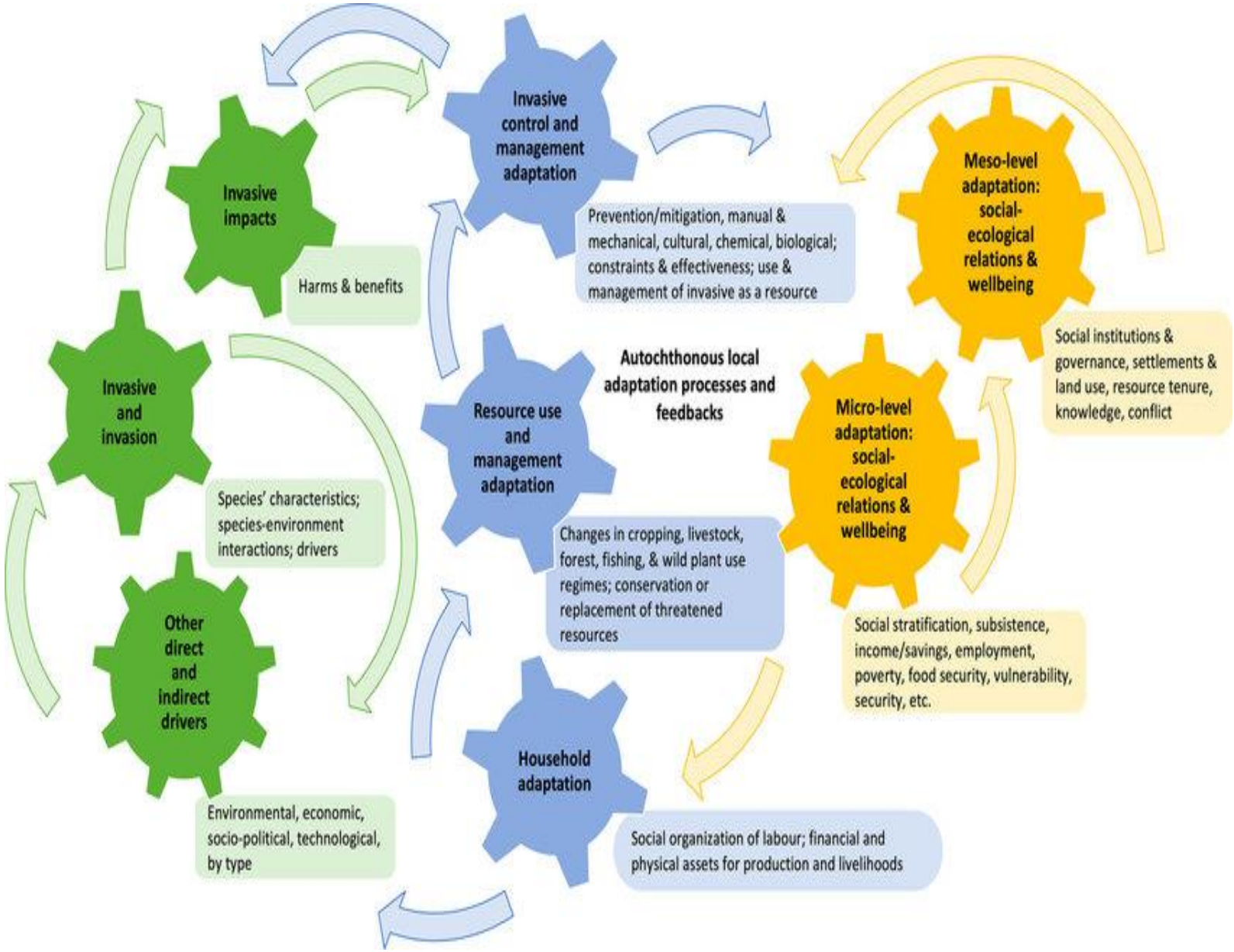
- Projected changes in yields vary a lot by region and crop. Declines are larger in low latitudes and declines increase in all regions over time.
- Adaptation measures include development of more resilient varieties, shifts to crops that are less affected by climate change, changes in timing of crops and increased efficiency in the use of water.
- A part of this is autonomous but a part involves public decision-making.

Impacts on Economic Sectors

- In most sectors other factors such as change in population, age structure, technology, relative prices and governance have bigger impacts than climate change.
- CC is expected to change energy demand between heating and cooling, location choices, demand for water. For increases in temperature of around 2ºC losses are estimated between 0.2 and 2% of income. But there are large differences between countries and losses go up with temperature.

High Temperature Increases…

- Now the average annual high temperature in European cities (e.g. London) is about 17^{0}C
- With an increase of 8^{0}C it would become like Cairo, which may be manageable. But with another 8^{0}C Cairo would become like Dallol Ethiopia, which is the hottest inhabited place in the world.
- Not much is produced in Dallok Ethiopia!



Climate change adaptation

Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2007).

Adaptation involves changes in social-ecological systems in response to actual and expected impacts of climate change in the context of interacting ***non-climatic*** changes. Adaptation strategies and actions can range from short-term coping to longer-term, deeper transformations, aim to meet more than climate change goals alone, and may or may not succeed in moderating harm or exploiting beneficial opportunities (Moser and Ekstrom, 2010).

Mitigation and/or Adaptation

- The optimal level of emission reductions results from equating the marginal costs of one unit of additional emission reduction with the discounted stream of additional avoided damages.
- What discount rate do we take for this? Major debate in climate economics.
- The least-cost emission pathway implies a small reduction in the absolute level of emissions until 2030 and a more rapid reduction afterwards. The lower the equilibrium climate sensitivity, the lower the benefits from emission reduction are, and hence the larger the flexibility to adjust the timing of emission reductions in the least-cost emission pathway. With high ECS the reductions have to be much greater early on (e.g. Weitzman type function).

Interactions Between Mitigation and Adaptation

- The role of adaptation is much smaller when damages are limited by least-cost mitigation action.
- Adaptation and mitigation are both powerful instruments to limit climate damages.
- In terms of cost minimisation, both policies are needed.
- Next figure clearly shows that adaptation cannot be a perfect substitute for mitigation. If only adaptation policies are available damages are substantially larger than when only mitigation policies are available

Principles for Effective Adaptation

1. Adaptation is place and context specific: no single approach will work in all settings.
2. Adaptation planning can be enhanced thorough complementary actions: protecting vulnerable groups, supporting economic diversification, providing information and improving coordination across levels of government and partnerships between private and public sectors.
3. A first step in adaptation is to reduce vulnerability to current climate variability.

Principles for Effective Adaptation

4. Recognition of diverse interests, circumstances and contexts can benefit decision-making.
5. The decision support is most effective when it is sensitive to context and diversity of decision types, processes and constituencies.
6. Existing and emerging economic instruments can foster adaptation by providing incentives for anticipating and reducing impacts.

Principles for Effective Adaptation

7. Common constraints that impede adaptation include limited financial and human resources, limited integration of governance, uncertainties about projected impacts etc. Underestimating the complexity of adaptation as a social process can create unrealistic expectations of outcomes.
8. Poor planning, emphasizing short term outcomes or failing to anticipate consequences can result in maladaptation.

Principles for Effective Adaptation

9. Limited evidence indicates a gap between global adaptation needs and the funds available for adaptation.
10. Significant co-benefits, synergies, and tradeoffs exist between mitigation and adaptation and among different adaptation responses; interactions occur both within and across regions. Increasing efforts to mitigate and adapt to climate change imply an increasing complexity of interactions, particularly at the intersections among water, energy, land use, and biodiversity

Conclusions

- IPCC WGII has made a sober assessment of the impacts of climate change. They are significant, vary by region and country and pose important threats to our future.
- The report concludes that while impacts in the next 30 years or so are not dependent on mitigation, after that time they depend a lot on what emissions scenario we face. Adaptation options post 2050 are much more limited with high emissions

Conclusions

- On adaptation it is more optimistic for several areas. We can adapt to a significant extent if we take the right actions.
- The key is to focus on developing adaptation strategies that are inclusive, flexible, that look at the wider picture and that are based on a realistic estimate of the benefits.
- Not all regions and not all problems can be solved in this way but many can.
- For some problems we have a more difficult agenda but even for these there is some hope.

Thank You!

Chonghua Yin
IGCI