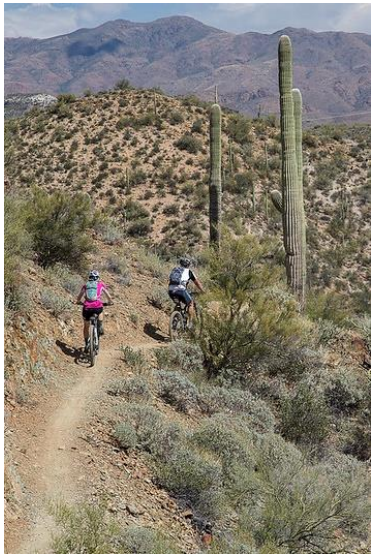
U.S. Department of the Interior
Bureau of Land Management

Ecosystem Accounting for Land, Water, Riparian, and Mineral Resources in Semi-Arid Climate Zones







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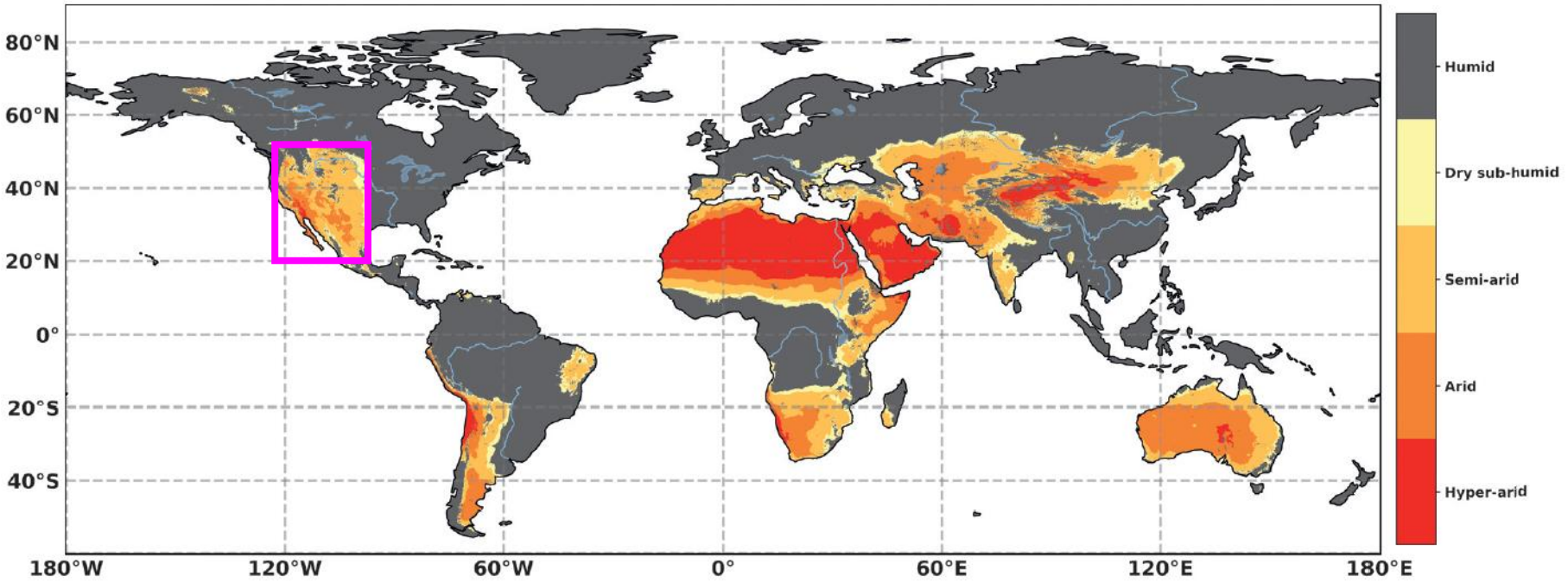
Disclaimer: The opinions are those of the author and do not necessarily reflect the official position of the Bureau of Land Management, U.S. Department of the Interior.

Ecosystem Accounting for Semi-Arid Zones

- **Semi-Arid** Zones
  - Unique **Meteorological** Features
  - **Seasonal** Fluctuation: Land, Water, Riparian, and Mineral Resources
- Natural Resource Management **Framework**
  - **Integrated** and **Cumulative** Impacts
  - Contribution from **Ecosystem Accounting**
  - Consideration of **Meteorological** Features
- **Summary**

Semi-Arid Zones



(Source: IPCC, 2022, Climate Change and Land: an IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems; https://www.ipcc.ch/site/assets/uploads/sites/4/2022/11/SRCCL_Full_Report.pdf)

Semi-Arid Zones: Landforms

Death Valley National Park
© *NPS / Dale Pate*

Bryce Canyon National Park
© *NPS*

Badlands National Park
© *NPS / Shaina Niehans*

Mojave National Park
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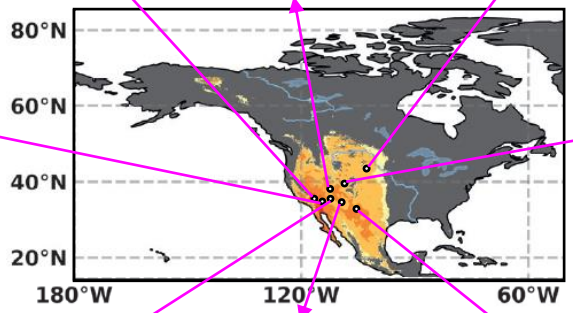

Colorado National Monument
© *NPS*

Grand Canyon National Park
© *NPS / Michael Quinn*

Petrified Forest National Park
© *NPS*

White Sands National Park
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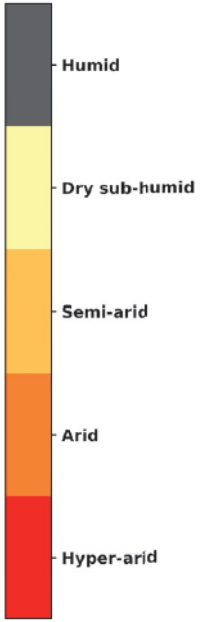


(Sources: based on IPCC, 2022, Climate Change and Land: an IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems, https://www.ipcc.ch/site/assets/uploads/sites/4/2022/11/SRCCL_Full_Report.pdf; U.S. National Parks Service, Arid and Semi-Arid Region Landforms, https://www.nps.gov/media/photo/gallery.htm?pg=5173831&id=06305DC6-4C58-4C92-9352-0FC82B769988, https://npgallery.nps.gov/AssetDetail/48f37a02-1dd8-b71b-0bb4-cb218908c4e1)

Semi-Arid Zones: Meteorological Features

Dry Days: the number of days per year when precipitation is less than 0.01 inch.

Higher Emissions: A possible future in which global emissions of heat-trapping gases continue to increase through 2100 (reaching 8.5 Watts per square meter in 2100).

Lower Emissions: A possible future in which global emissions of heat-trapping gases peak around the year 2040 and then decrease (stabilizing at 4.5 Watts per square meter in 2100).

(Source: based on Climate Explorer, https://crt-climate-explorer.nemac.org/)

Semi-Arid Zones: Meteorological Features

1950-2013 Observations

(Source: based on Climate Explorer, https://crt-climate-explorer.nemac.org/)

Semi-Arid Zones: Seasonal Fluctuation

October ~ May

June ~ September

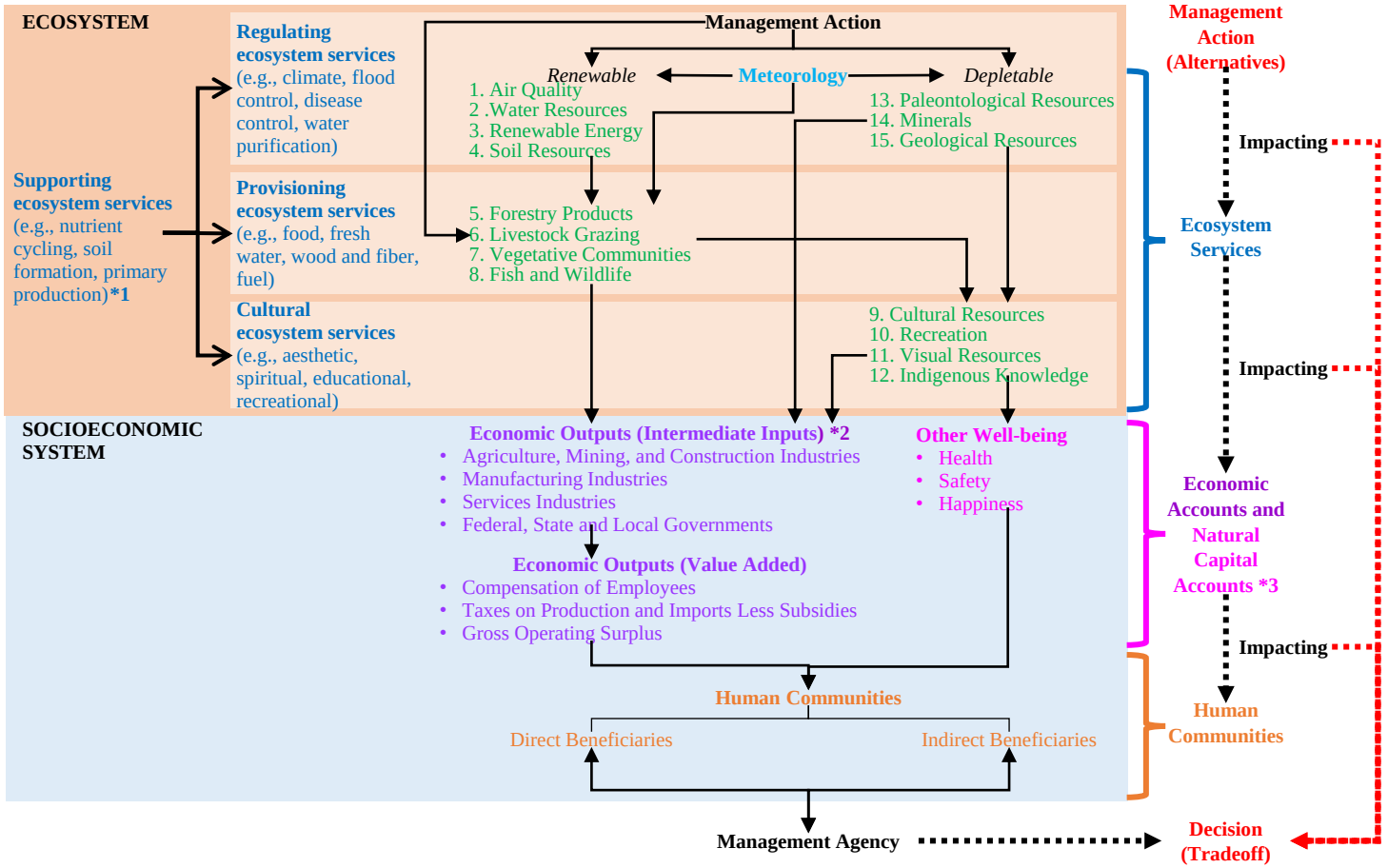
Wet season:

Water is present and used for riparian irrigation, grazing etc.

Dry season:

Water is absent; riverbed used for sand mining and mineral extraction.

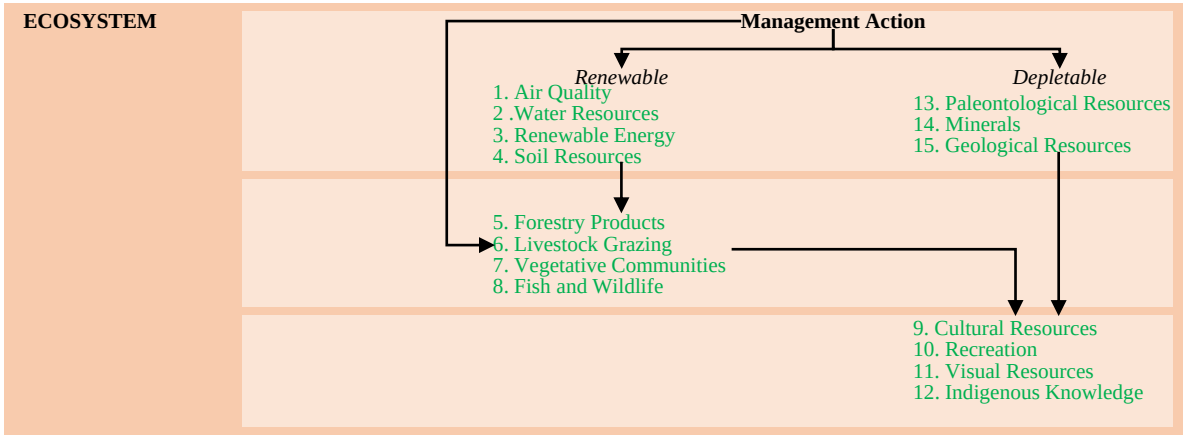
Natural Resource Management Framework



- A holistic framework
- ➢ for understanding integrated impacts and cumulative impacts of management actions on diverse human communities
- ➢ For incorporating ecosystem accounting in 6 steps

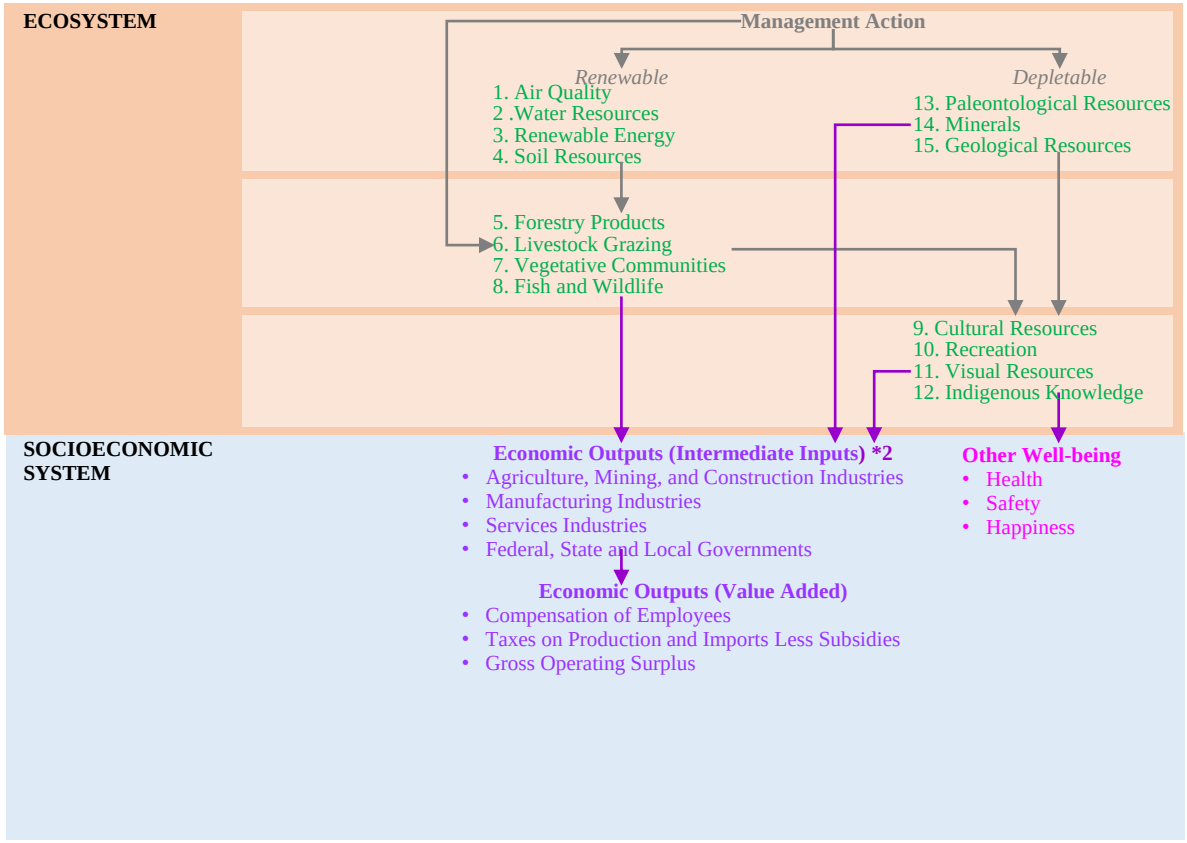
Notes: *1 *- Millennium Ecosystem Assessment (MEA), 2005, Ecosystems and Human Well-being, Island Press, Washington, D.C., https://www.millenniumassessment.org/en/Reports.html.* ****2*** *- the structure of the economic outputs is based on U.S. Bureau of Economic Analysis (BEA), 2011, Measuring the Nation's Economy: An Industry Perspective, A Primer on BEA's Industry Accounts, https://www.bea.gov/sites/default/files/methodologies/industry_primer.pdf.* ****3*** *- The White House, 2023, A U.S. System Of Natural Capital Accounting And Associated Environmental Economic Statistics, https://www.whitehouse.gov/wp-content/uploads/2023/01/Natural-Capital-Accounting-Strategy-final.pdf.*

Natural Resource Management Framework



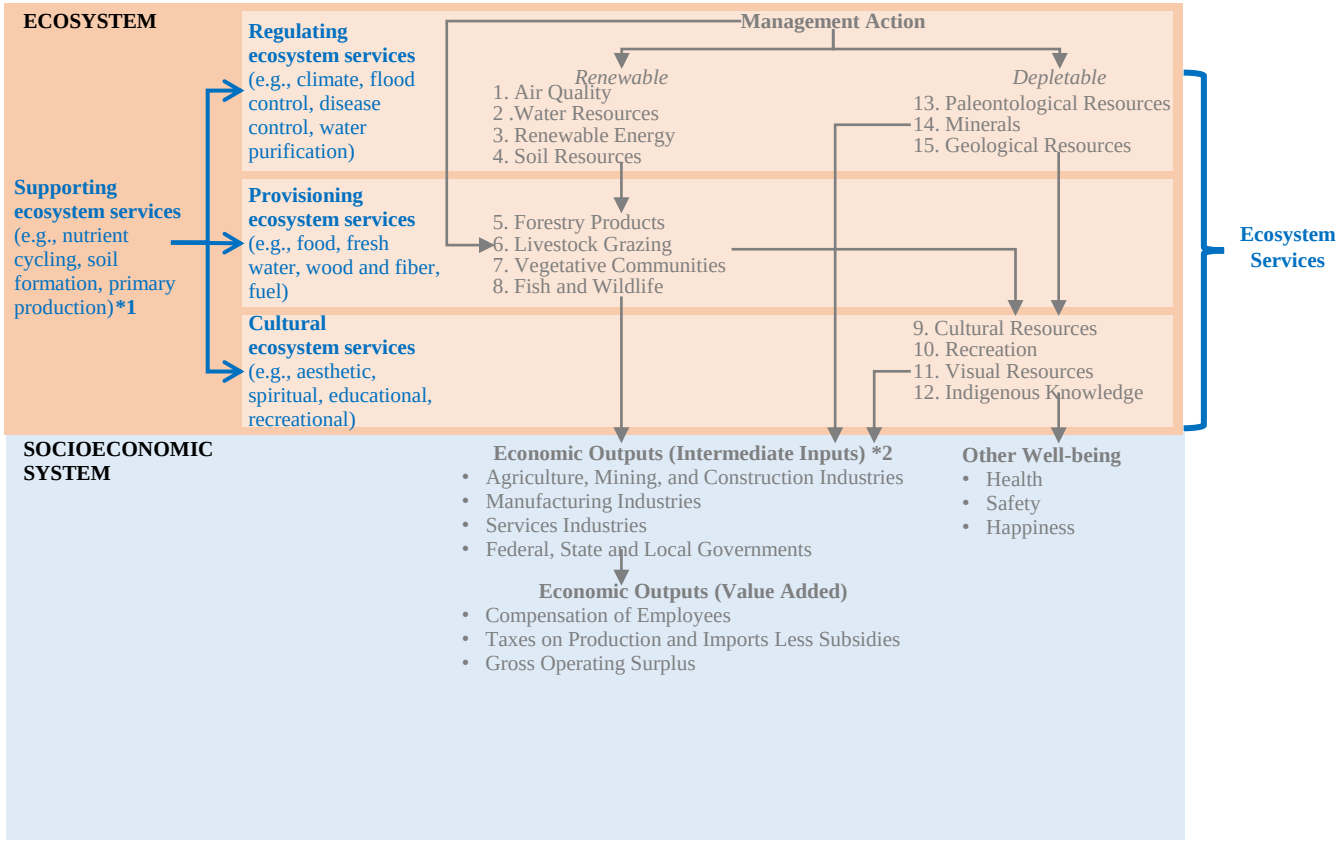
(1) Natural resource management involves multiple interrelated scientific disciplines and databases

Natural Resource Management Framework



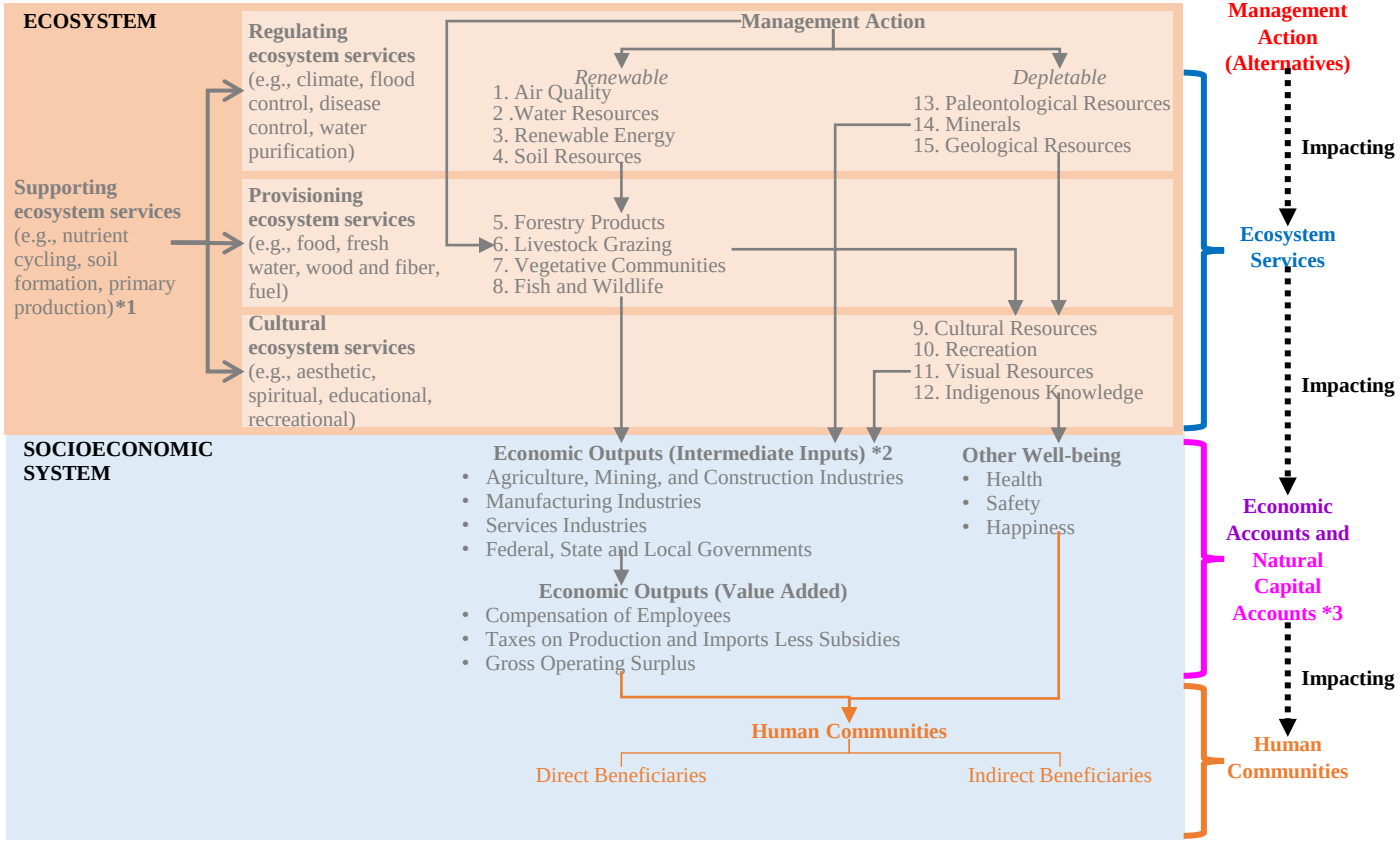
(2) Natural resources are the foundation for economic outputs and other elements of human well-being

Natural Resource Management Framework



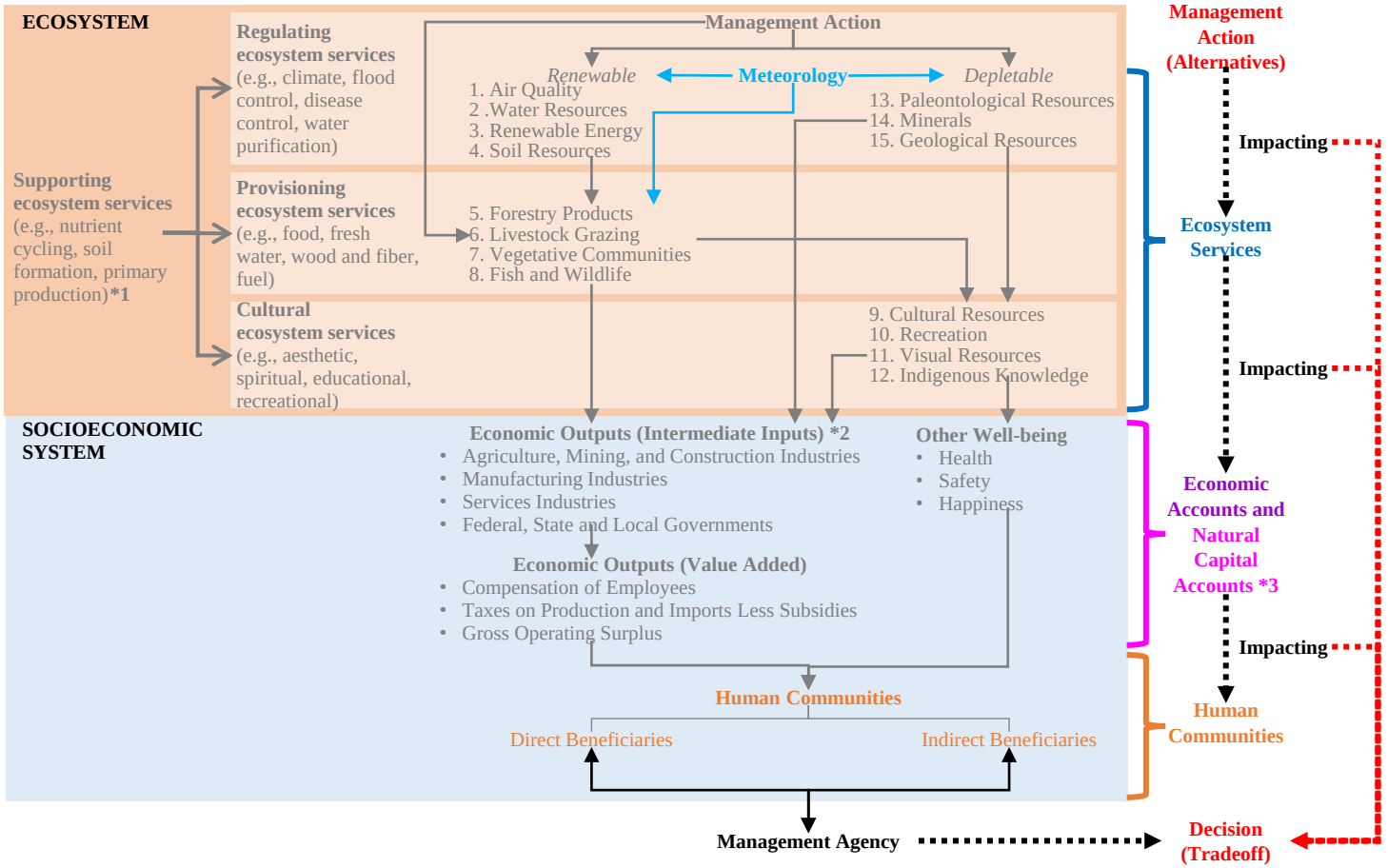
(3) Ecosystem services is an analytical unity for natural resource management

Natural Resource Management Framework



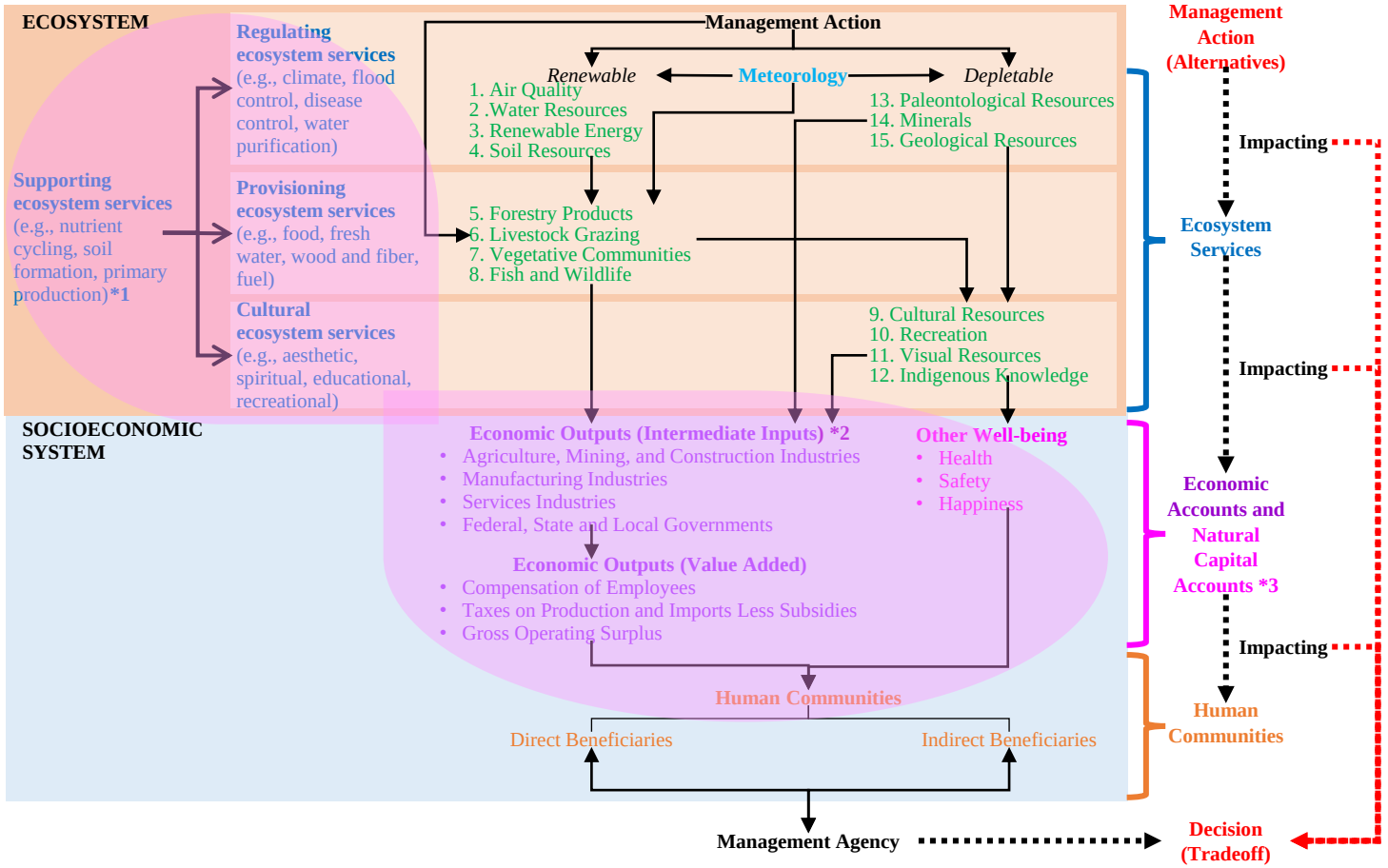
(4) Ecosystem accounting contributes to analyzing integrated impacts and cumulative impacts from management actions on human societies

Natural Resource Management Framework



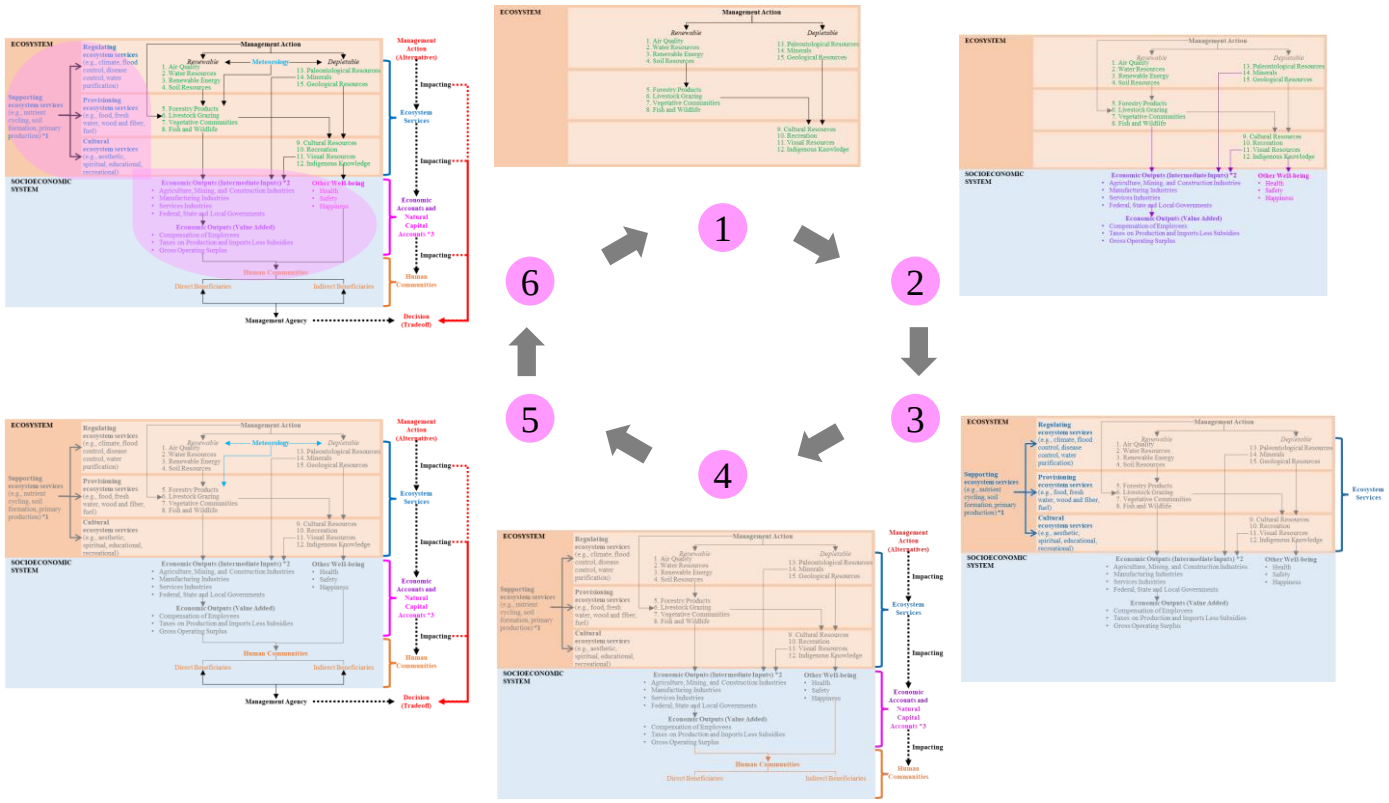
(5) Incorporating meteorological features of semi-arid zones allows testing dynamic models and understanding tradeoff of decisions

Natural Resource Management Framework



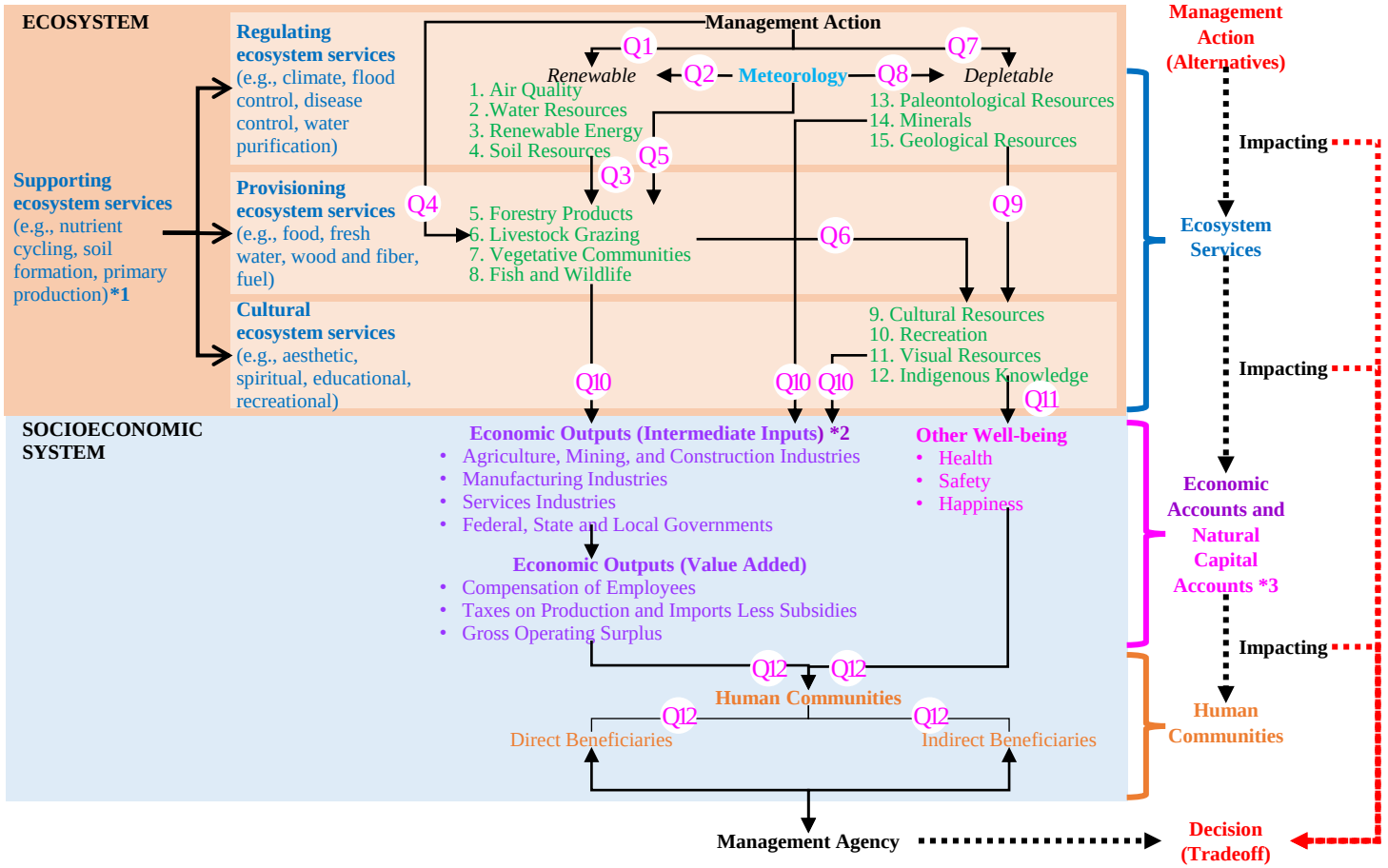
(6) Incorporating meteorological features of semi-arid zones contributes to monitoring and evaluation of sustainability and resilience of human societies in adaptation to ecosystem changes

Natural Resource Management Framework



- 6 steps for incorporating ecosystem accounting in natural resource management

Natural Resource Management Framework



For more details and an example, please refer to the paper accompanying this presentation.

Summary

- **Ecosystem accounting** is an important contribution to integrated and cumulative impact analyses in natural resource management
- Incorporating meteorological features of **semi-arid zones** into ecosystem accounting is crucial
  - Advancing **sciences**
  - Developing interdisciplinary **databases** both physical and monetary accounts
  - Testing dynamic **models**
  - Implementing effective **applications**
  - Understanding **tradeoff** of decisions
  - Contributing to **decision-making** at all levels
  - Contributing to **sustainability** and **resilience** measures

Thank You!

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