Ecosystem Services and Green Growth

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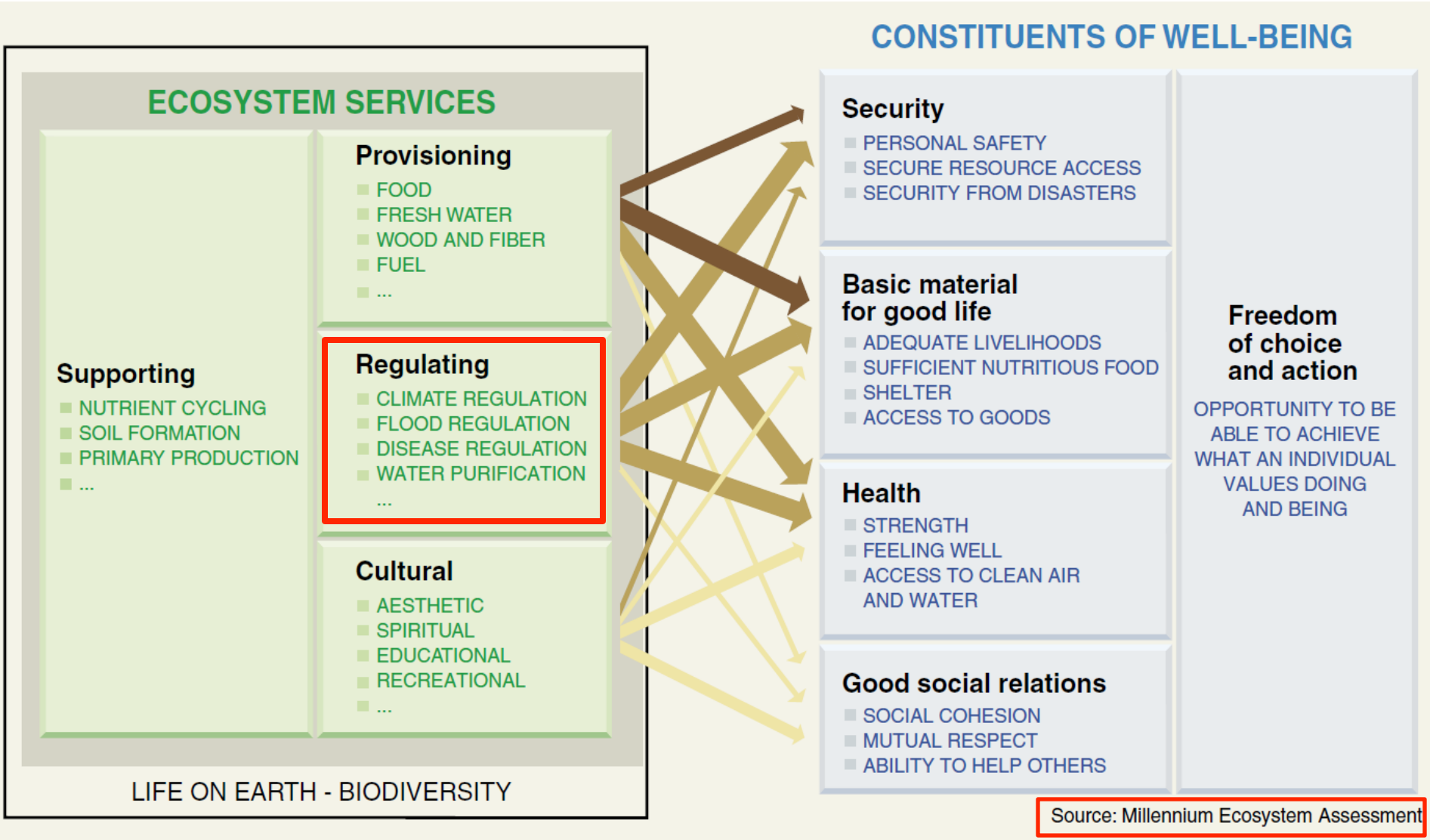
Objective

- To review evidence on the effect of changes in the supply of ecosystem services, and programs to increase their supply, on near-term economic growth
  - **Near-term**: few years to a decade or so
  - **Economic growth**: conventional monetary measure of change in economic output (e.g., GDP)



Regulating services

- **Already reflected in overall GDP, but misallocated between sectors**
- **Paper focuses on domestic services**

Key conditions for near-term growth stimulus

1. A conservation program must either restore a degraded ecosystem or reduce the loss of an intact one
2. This positive ecosystem change must increase the supply of an ecosystem service
3. The increased supply must occur within a short period of time
4. The service must be economically valuable

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- Valuation literature: emphasis on forest ecosystem services
- General finding of studies by economists: small, with great spatial variation
  - Lampietti & Dixon (1995), Pearce (2001), Croitoru (2007): on average, regulating services = 5-15% of total value of forest goods and services
    - Timber ≈ ⅓- ½
  - Timber harvest ≈ 0.2% of global GDP
  - All services of forests—not just regulating—probably < 1% of global GDP
    - Caveats: incomplete estimates, suboptimal management
    - Costanza et al. (1997): forest ecosystem services = 25% of global GDP; all ecosystem services ≈ 2 × global GDP

Inadequate control for confounding factors → exaggerated estimates of service values

- Flood mitigation by forests
  - Bradshaw et al. (2007): natural forest area has significant, negative effect on flood frequency in 56 developing countries during 1990-2000
  - van Dijk et al. (2009): population density explained 83% of the variation in reported flood frequency, with forest cover explaining less than 1% of the remaining 17%

- Pollination services by natural habitat
  - Observed negative relationship between crop yield and distance to natural habitat typically assumed to be due to reduced pollination (Ricketts et al. 2008)
    - But: productivity can decline for other reasons (e.g., soil fertility)
  - Meta-analysis (Ricketts et al. 2008): number and diversity of pollinators declines significantly with distance, but fruit set does not
    - → pollinators not scarce
  - Damage costs (e.g., reduction in gross revenue) and replacement costs (e.g., renting bee hives) can exaggerate economic losses: inadequately account for farmer responses (McConnell and Bockstael 2005)
    - Winfree et al. (2011): > 2× for watermelons in NJ and PA

Spatial variation in values: Pattanayak & Kramer (2001)

Figure 2. *Map of Indonesia (arrow points to Flores Island)*

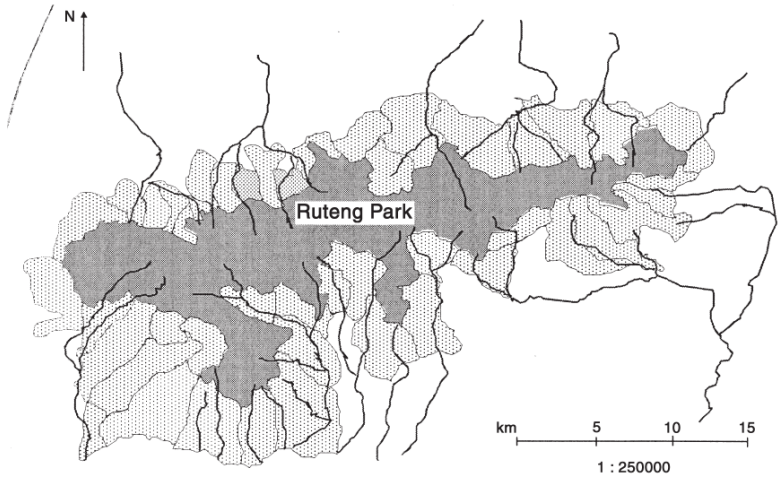

Figure 3. *Rivers of Manggarai (37 watersheds in west-central Flores)*

Kecamatan *(county)* **6A**	*Drought mitigation benefits of 25% forest cover increase* ($)***	
	median	*min/max*
Borong	4.27	−10.67/20.45
Elar	−6.74	−12.76/4.73
Langke Rembong	−9.57	−12.72/3.42
Pembantu Borong	3.36	−9.74/19.54
Pembantu Elar	10.15	3.31/15.28
Pembantu Lambaleda	−8.06	−14.15/−1.32
Pembantu Ruteng	−4.25	−6.23/−3.38
Ruteng	−0.86	−10.46/6.37
Satarmese	3.35	−11.52/10.12

2. Positive ecosystem change must increase the supply of an ecosystem service

- Need better evidence that this happens
  - Forests and floods, droughts
  - Natural habitat and pollination
- Services are not necessarily spatially compatible
  - E.g., timber and water quality
  - Diseconomies of scope: optimal ecosystem management may require spatial specialization, instead of managing for all services in all areas

3. Increased supply of a service must occur within a short period of time

- Restore degraded ecosystems
  - Review of 240 studies (Jones and Schmitz 2009): "startling evidence that most ecosystems globally can, given human will, recover from very major perturbations on timescales of *decades to half-centuries*"
    - Focused on supporting services
    - "many of the ecosystems considered were relatively undegraded at the outset" (Bullock et al. 2011, p. 544)

- Prevent loss of intact ecosystems
  - *Local* effects, where ecosystems being lost rapidly and provide important services
  - Greatest potential for large impact: REDD (transboundary)

1. Conservation program must either restore a degraded ecosystem or reduce the loss of an intact one

- Programs to reduce ecosystem loss
  - Protected areas (PAs)
  - Payments for ecosystem services (PES)
  - Integrated conservation-development projects (ICDPs)
- Impact evaluations of conservation programs
  - Ecosystem loss with program vs. without program
  - Still rare: 6-12 studies for each type, limited geographical coverage
    - Focus on reduced deforestation
  - Estimated impact: very small

Are impact evaluations too pessimistic?

- Reduced deforestation not only or primary objective of forest protection: reduced logging, reduced poaching
- Protecting less threatened ecosystems might be economically efficient
  - Site 1: deforested in n years

    Site 2: deforested now
  - Site 1 should be protected if: $\frac{V_1}{P_1(1+r)^n} > \frac{V_2}{P_2}$

    V_i = conservation value

    P_i = acquisition price

    r = discount rate
  - Results of impact evaluations need to be better integrated with information on conservation benefits and costs

Poverty alleviation

- Major reason for development organizations' emphasis on economic growth
- Conservation programs and poverty alleviation
  - Theory
    - PAs: negative effect
    - PES: mixed effects
  - Practice
    - PAs (impact evaluations): surprisingly large, positive local effects
      - Seemingly due to tourism
      - Conservation vs. poverty: win-win or win-draw, but "wins" in different places
    - PES (case studies): small gains for rural landowners, little for rural landless
      - If like conditional cash transfer programs, then MPC payments is high;
        → stimulus is near-term, not long-term

Research needs

- Rigorous evaluation of the impacts of conservation programs
  - Broader range of outcomes besides deforestation
  - Stronger effort to relate estimates of conservation effectiveness to conservation benefits and costs
  - Continued progress toward understanding spatial variation
- Time path of service losses and economic impacts when ecosystems degrade
  - Careful control for potentially confounding factors
- Improved methods for scaling up microlevel studies on ecosystem service values, so can be linked to standard statistics on economic performance
- More research on the growth impacts of cultural services

Near-term growth vs. Long-run welfare

- Focus on near-term economic growth does not imply that ecosystem protection is justified only if it stimulates near-term growth
  - Ecosystem protection is justified whenever it raises long-run social welfare, regardless of the consequences for near-term growth

Thank you!

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