Benefits of interrelationships between climate change mitigation and adaptation
– a case study of replanting mangrove forests in Cambodia

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Publication date:
2014

Document Version
Peer reviewed version

Benefits of interrelationships between climate change mitigation and adaptation

– a case study of replanting mangrove forests in Cambodia

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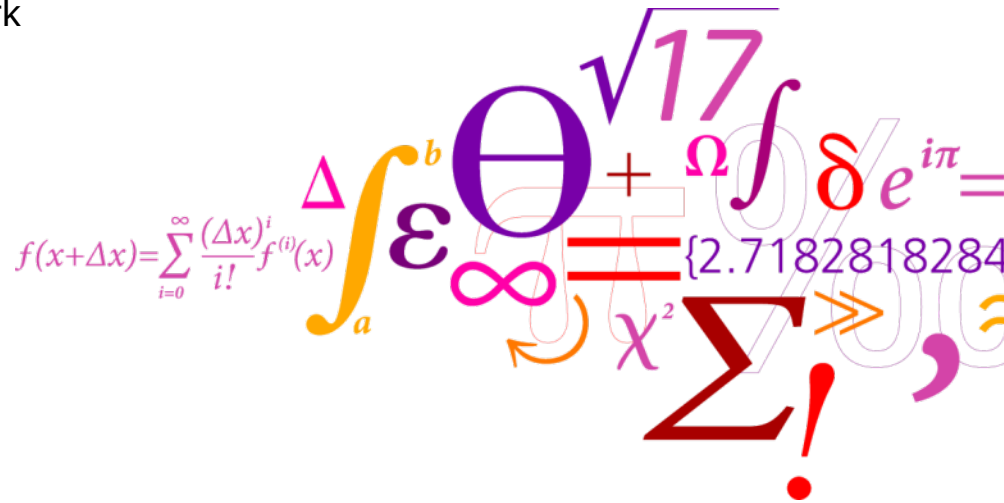

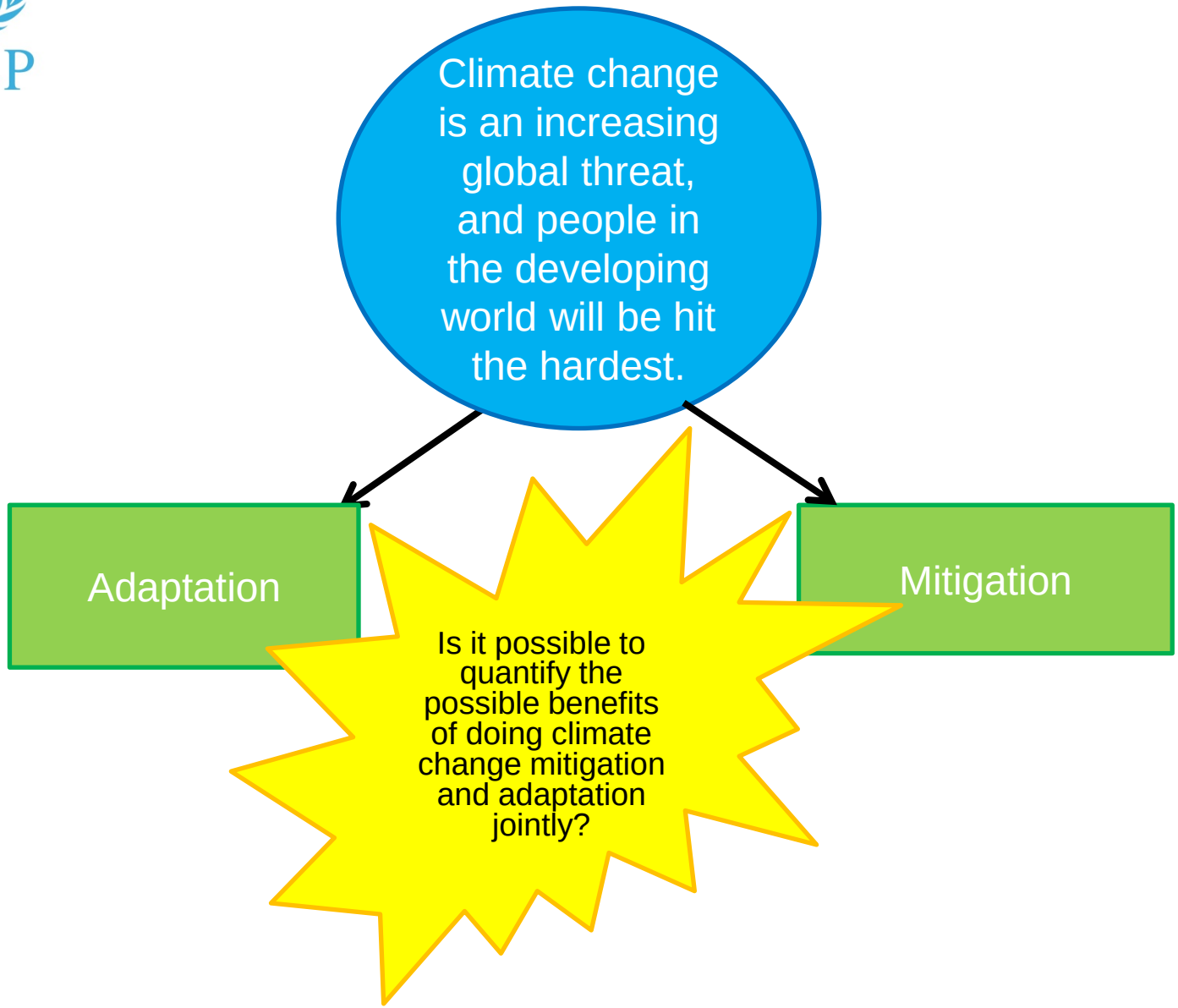
Climate change is an increasing global threat, and people in the developing world will be hit the hardest.
Adaptation
Mitigation
Is it possible to quantify the possible benefits of doing climate change mitigation and adaptation jointly?

Outline…

- Local context
  - Case study: Peam Krasaob Commune
  - Climate Changes in Cambodia

- How to measure a possible benefit between CC mitigation and adaptation –Joint production
  - (benefit of CC mitigation)
  - benefit of CC adaptation
    - EDF
      - Storm damage function
      - Damage cost function

- Questions to you….

Peam Krasaob Wildlife Sanctuary, Cambodia

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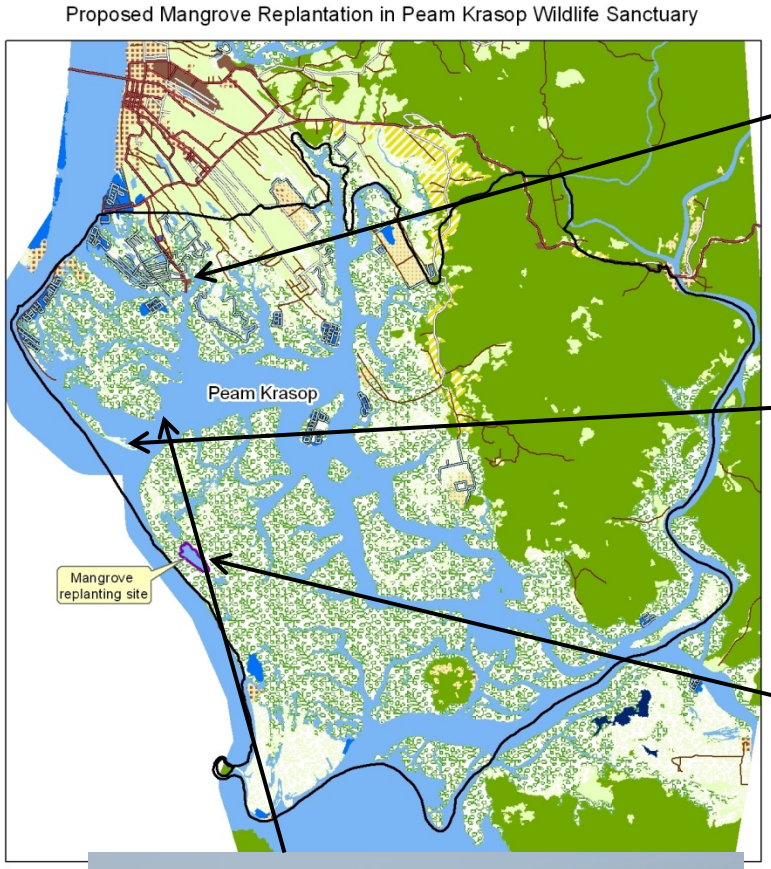


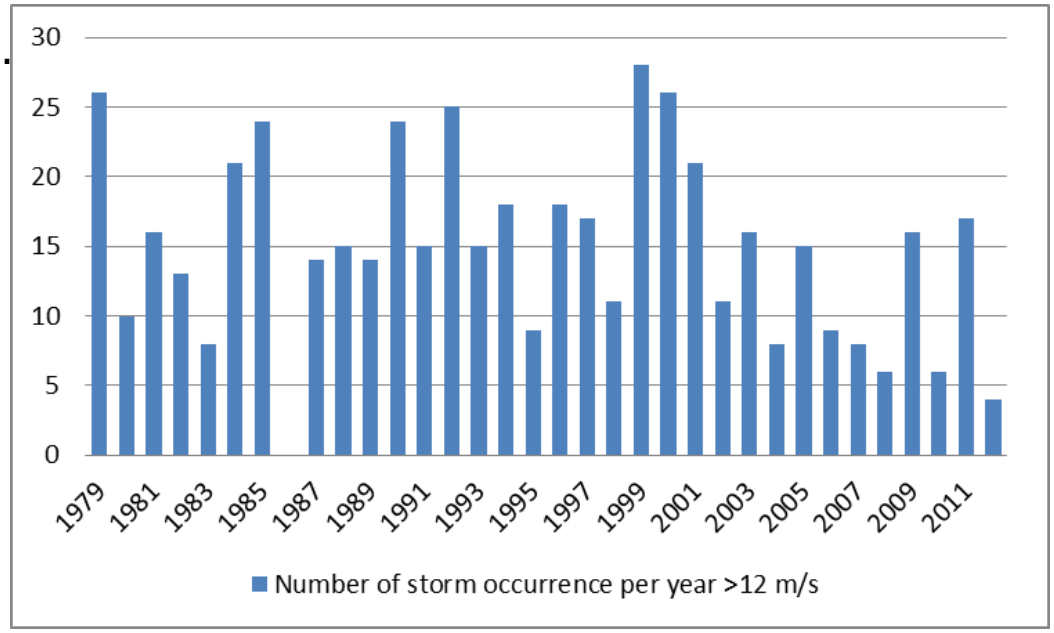
Climate change predictions for Cambodia

- Increasing number of hot days.
- Increasing precipitation (leading to flooding).
- Drought.

Threats to Cambodia's coastal zone

- Tropical cyclones, storm surges.
- Rising sea level
- Beach erosion.
- Saltwater intrusion (on farm land).

2011: 1,4 hectares of mangrove forest were destroyed do to wind damages. Estimated material damage: 59.400 US$ (178 US$ per HH)



How to measure the possible benefits of climate change mitigation and adaptation, respectively?

Joint production (Vincent & Binkley 1993)

- Or multiple-use forestry
- The two products:
  - **CC mitigation:** Carbon sequestration in the replanted mangrove forest (global benefit).
  - **CC adaption:** The mangrove forest's ability to protect the local community from storm damages (local benefit).
- Management efforts need to be allocated between the two products or the size of the stand etc.

CC adaptation benefits?

- **Expected Damage Function (EDF)**
  - (Hanley & Barbier 2009, Barbier 2007)

EDF costs avoided (do to replanting of the mangrove forest (**S**))

- EDF cost

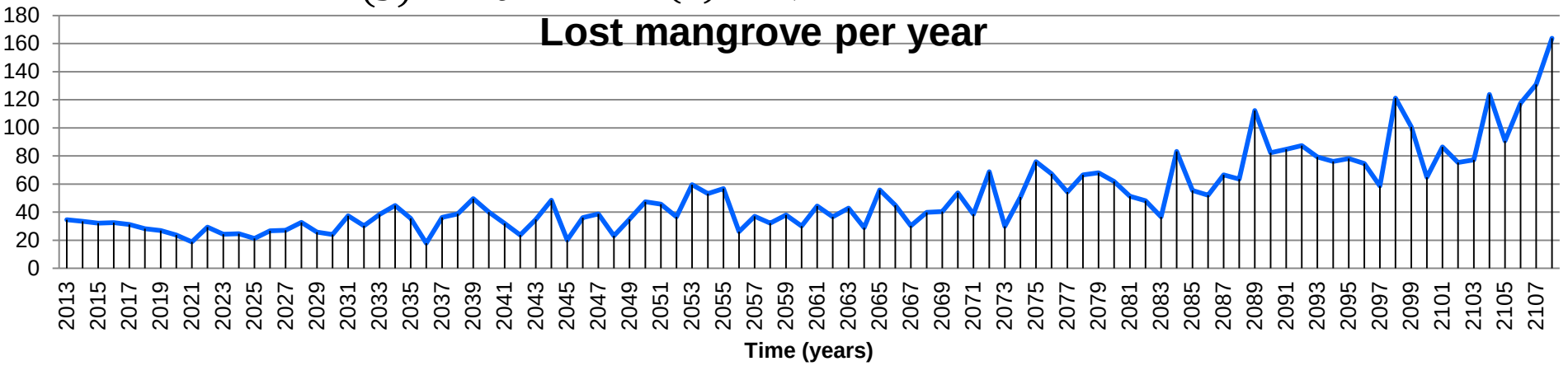
= The **benefit of the adaptation** capacity

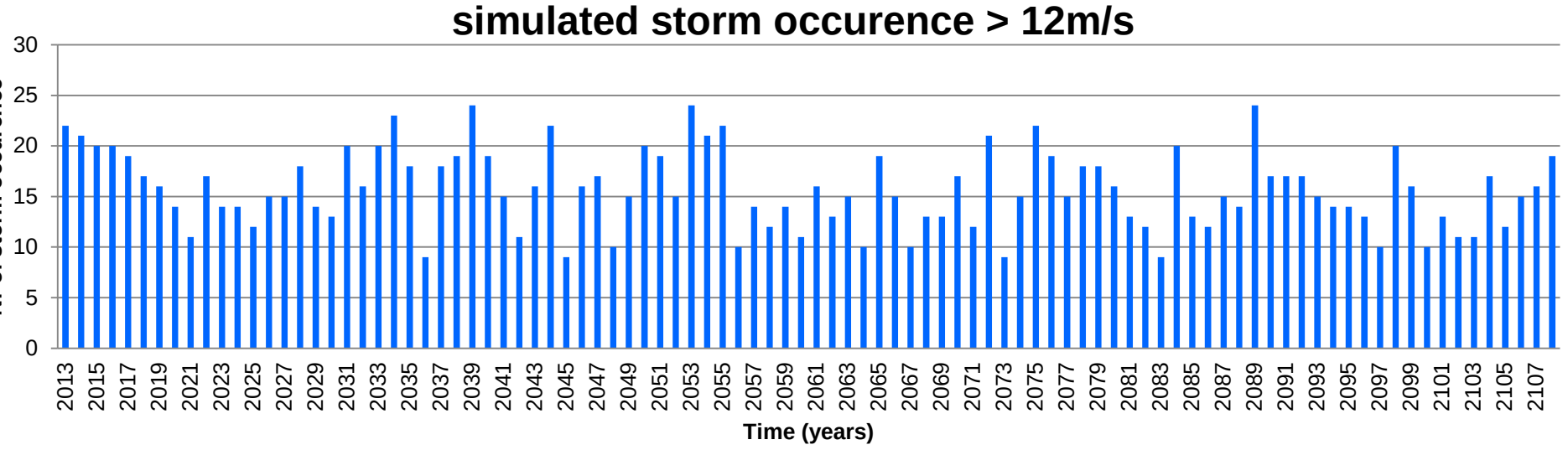
Assumption made (Barbier 2007, Hanley & Barbier 2009):

- The local community owns all economic activities and properties, and the properties are threaten from damages of storm.
- The households are identical, so one household can represent all households.
- The representative household expenditure function is expressed as $m(P^x, Z, U^0)$.
  - P^x is the price vector for acquired goods consumed by the household.
  - **z** represents the number of storms and natural hazard occurrences (which can vary).
  - U^0 is the utility level for the household's minimum spending necessary to reach this utility level.

Storm damage function -damages on the mangrove forest caused by natural disasters and storm
-We simulate the storm occurrences over the next 100 years – assuming that the function for damage per storm looks like this:

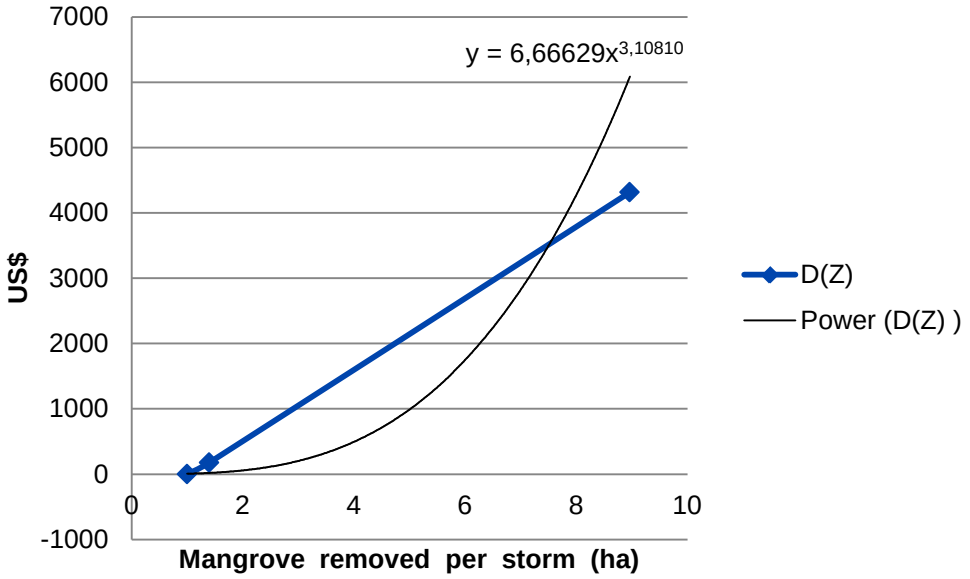
$$z(S) = Ke^{-aS} \qquad z'(S) < 0, z'' > 0$$

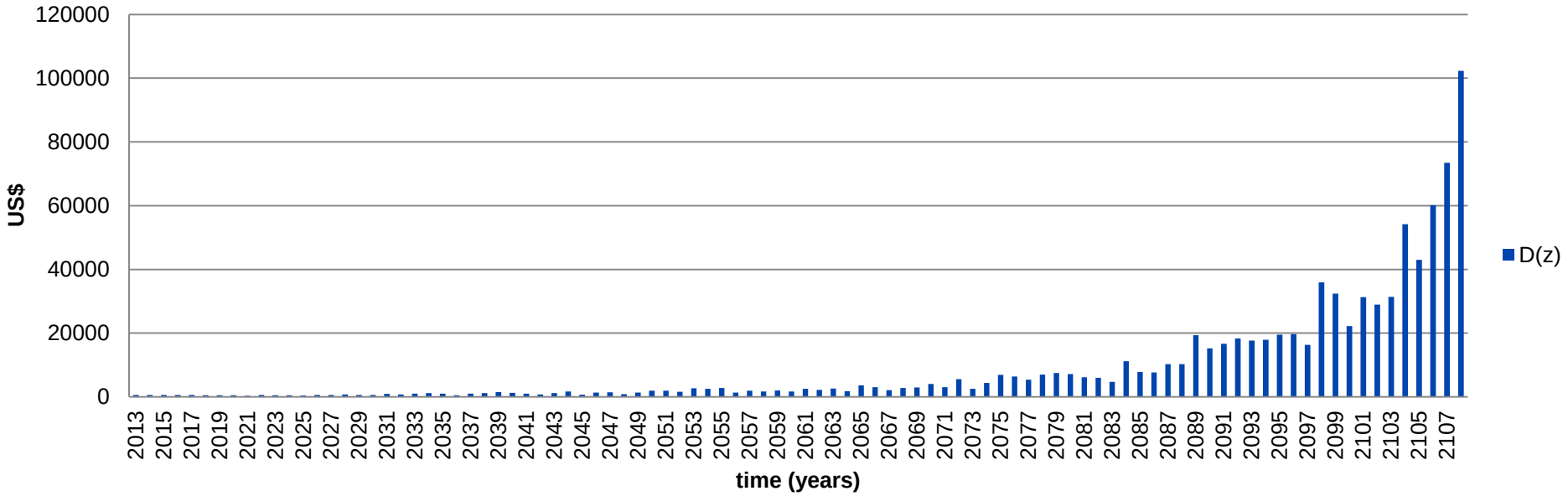




Damage cost function

- Based on what we know of z(S) (lost mangrove per storm do to storm and natural hazards), we can plot what we know:
  - Estimated damages in 2011 per HH.
  - Estimated cost of total destruction of HH.
- Assuming this damage function:
  $\boldsymbol{D(z) = bz^g}$

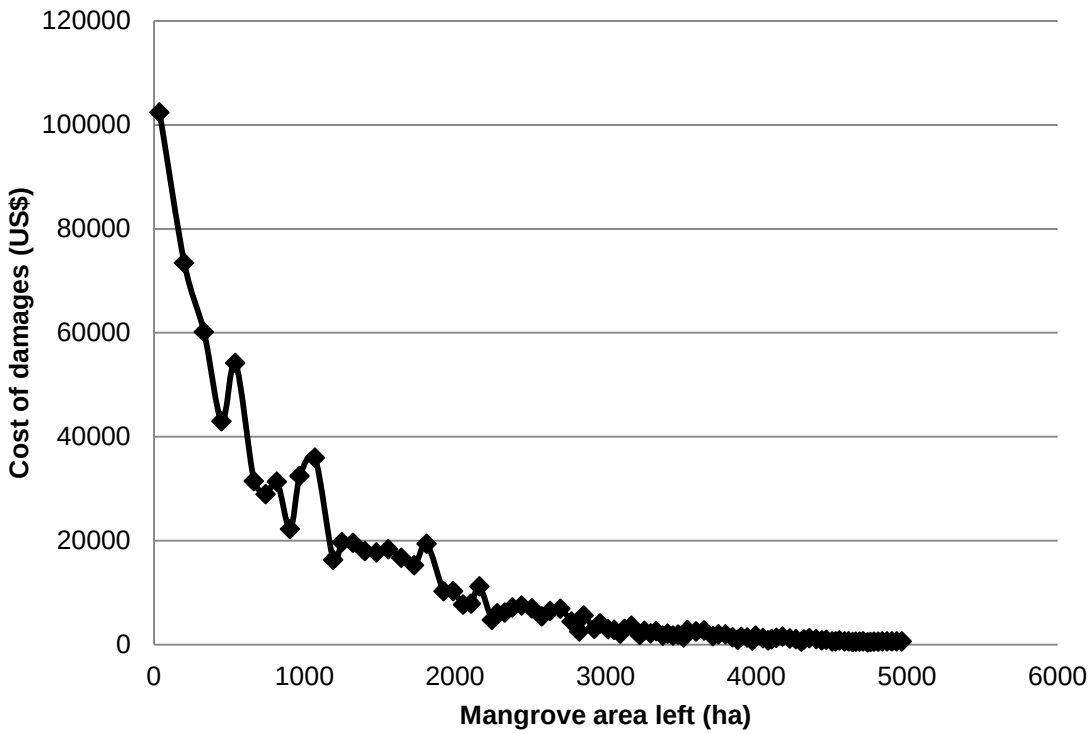




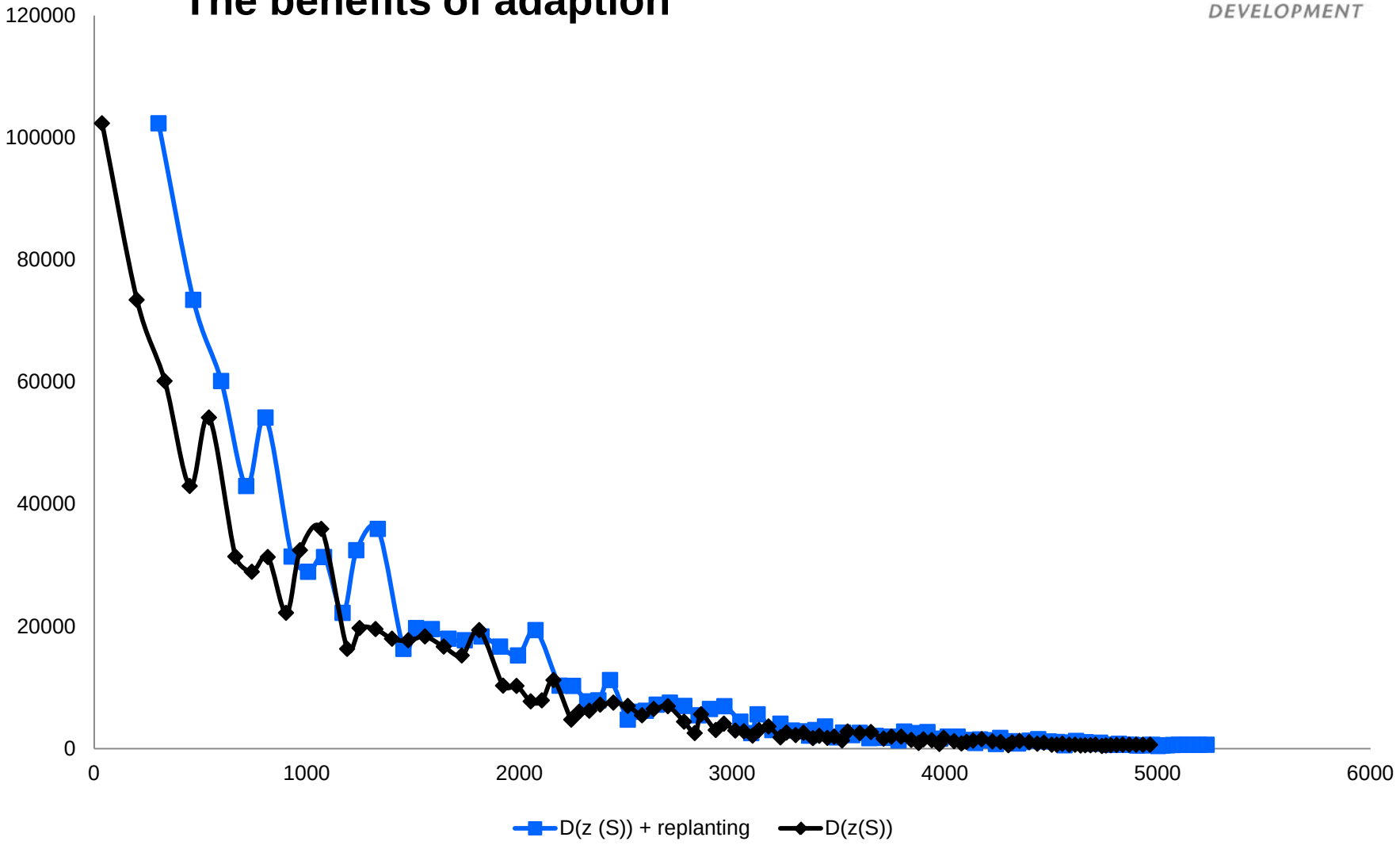
Expected Damage Function ~ D(z(S))

- $D(z(S)) = b(Ke^{-aS})^g$

- Knowing the **storm damage function z(S)** for storm hazards per year and the **damage cost function D(z)** per year, it is possible to calculate the **expected damage cost** of a change in the mangrove area.
- It is also possible to determine the benefits for the mangrove forest protecting the local community.



EDF (cost avoided; when replanting of the mangrove forest**) – EDF (costs;** when loosing the mangrove forest**) =**
The benefits of adaption



Questions to you….

- What are **the local and global benefit**, respectively, of carbon sequestration in the replanted area?
- Are there other ways to **simulate climate changes' impact** (damage) on the mangrove forest?
- Is it realistic to consider it a **joint production, as no immediate trade-off is found** between mitigation and adaptation (in this case)?
- Is the assumption concerning the **storm damage function** and the **damage cost function** acceptable?

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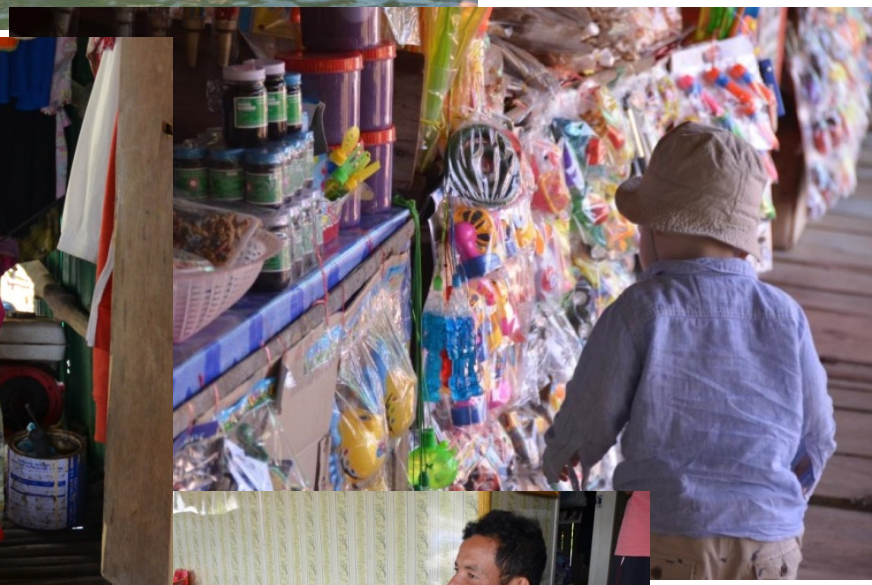
Thank you…



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