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The Impact of Biodiversity Loss on the Philippine Banking System: A Preliminary Analysis

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3rd BSP International Research Fair
13-14 June 2023

1. Let us start with some definitions

- **"Nature"** captures both the biotic (living) and abiotic (non-living) elements of our planet. These are sometimes referred to as **"natural capital"** (IPBES 2019)

- Both the living and non-living elements of nature combine in **"ecosystems"**, which yield a flow of benefits also described as **"ecosystem services"** (or nature's contribution to people)

- The ability of nature to provide these ecosystem services depends on **"biodiversity"**

- **"Biosphere"** is the sum of all the ecosystems of the world. It is both the collection of organisms living on the Earth and the space that they occupy on part of the Earth's crust (the lithosphere), in the oceans (the hydrosphere), and in the atmosphere (IPBES 2019)

- **"Biodiversity"** concerns the variability among living organisms - diversity within species, between species and of ecosystems (IPBES 2019)

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2. What motivates our study (1-2)

- **Global discourse**
  - Loss of biodiversity and other nature-related risks becoming relevant policy issues (Dasgupta, 2021)
  - Nature crisis is no less threatening than the climate crisis; it is much less appreciated and much less is being done to mitigate it (Menon, 2022)
  - COP 15 Montreal plan specifies concrete measures to help stop and reverse nature loss === placing 30% of the planet and 30% of degraded ecosystems under protection by 2030, and increasing finance to developing countries

- **Recent studies**
  - Biodiversity loss could have economic and financial implications (Toronto Centre, 2023)
  - An external driver of financial risk === physical, transition, and reputational risks to financial sector

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2. What motivates our study (2-2)

- The Philippines is biologically rich -
  - One of the 17 mega-diversity countries in the world
  - On a per unit area, has the greatest concentration of endemic species in the world
  - Has 228 Key Biodiversity Areas which are known habitats of 855 globally important species
  - But, ranks high as a biodiversity hotspot and a global conservation area

- A formal study on potential dependencies of ecosystem services to nature and impact of biodiversity loss on financial system remains limited

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3. Recent findings on impact of biodiversity loss remain scant (1-2)

- Biodiversity is declining at its fastest rate in history - land conversion, pollution, and human-induced climate change (Francia 2020)

- Few studies on dependency on nature
  - 36% of Dutch financial institutions' total portfolio highly or very highly dependent on one or more ecosystem service (Van Toor et al. 2020)
  - 42% of values of securities held by French financial institutions originate from issuers considered as highly or very highly dependent on one or more ecosystem services (Svartzman et al. 2021)

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3. Recent findings on impact of biodiversity loss remain scant (2-2)

- Recent study examines exposure to sectors and regions highly vulnerable to nature-related risks, including biodiversity loss (WB and BNM 2022)

  - Malaysian banks are exposed to physical and transition risks;

  - In terms of physical risk, heterogeneity in bank portfolio to one or more sectors highly or very highly dependent on ecosystem services;

  - Limited exposure of banks to Key Biodiversity Areas that may be increasingly protected going forward;

  - Using an exploratory set of nature-related events, adverse physical and transition risks scenarios can affect banks; and

  - Agriculture, forestry, fisheries, and tourism are affected by a number of financial and transition risk scenarios.

- This study estimates the potential impact of biodiversity loss on financial system using stylized stress test results from lending data of UKBs

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4. What the paper does

- Identify the extent to which local banks are potentially exposed to physical risks from biodiversity loss using lending data of universal and commercial banks and global data on biodiversity loss

- Estimate the initial impact of biodiversity loss on bank-level outstanding credit and effect on bank capital adequacy ratio using a stylized bank solvency stress test

- Two questions: (a) Does biodiversity loss affect the Philippine banking sector? and (b) Does the loss of biodiversity have an impact on bank solvency?

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Rest of the Presentation

5.   State of natural capital assets in the Philippines

6.   Data and methodology

7.   Initial results

8.   Conclusion - way forward

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5. State of natural capital assets in the Philippines (1-4)

Table 1: Estimated values of Philippine biodiversity and ecosystem services

Ecosystem service	In PhP billion (As of December 2016)	Share to Estimated Total Value of Ecosystem Service (%)
Timber and fuelwood production	1.1	0.05
Water provision	50.9	2.3
Ecotourism	157.0	7.0
Carbon offset	453.0	20.2
Flood prevention	41.0	1.8
Soil erosion	10.0	0.4
Fishery production	111.0	4.9
Crop production	1,416.0	63.0
Mangrove	7.4	0.33
TOTAL	2,247.4	100.0

Source: Mercado, 2016; Compiled by the Biodiversity Finance Initiative (BIOFIN); Authors.

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- **2018 Input-Output table** : Agriculture, Forestry, Forestry and Fishing (AFF, 9.5% of total output); Mining and Quarrying (0.7%); and Electricity, Steam, Water, Waste and Waste Management (0.4%) === **10.6% of total output**

- AFF sector supplied **13.0% of the total intermediate goods and services** used in the economy === crop production (5.5% of total intermediate demand), livestock (4.9%), forestry and logging (0.04%); and fishing and aquaculture (1.4%)

- AFF sector connected to almost all industries, either directly or indirectly; other sectors have a high dependency on AFF sector

- **Spatial linkages not covered in this data**; AFF sector more located in rural sectors, whereas service sectors and many industries located more in larger cities (Metro Manila)

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5. Indications of biodiversity loss in the Philippines (3-4)

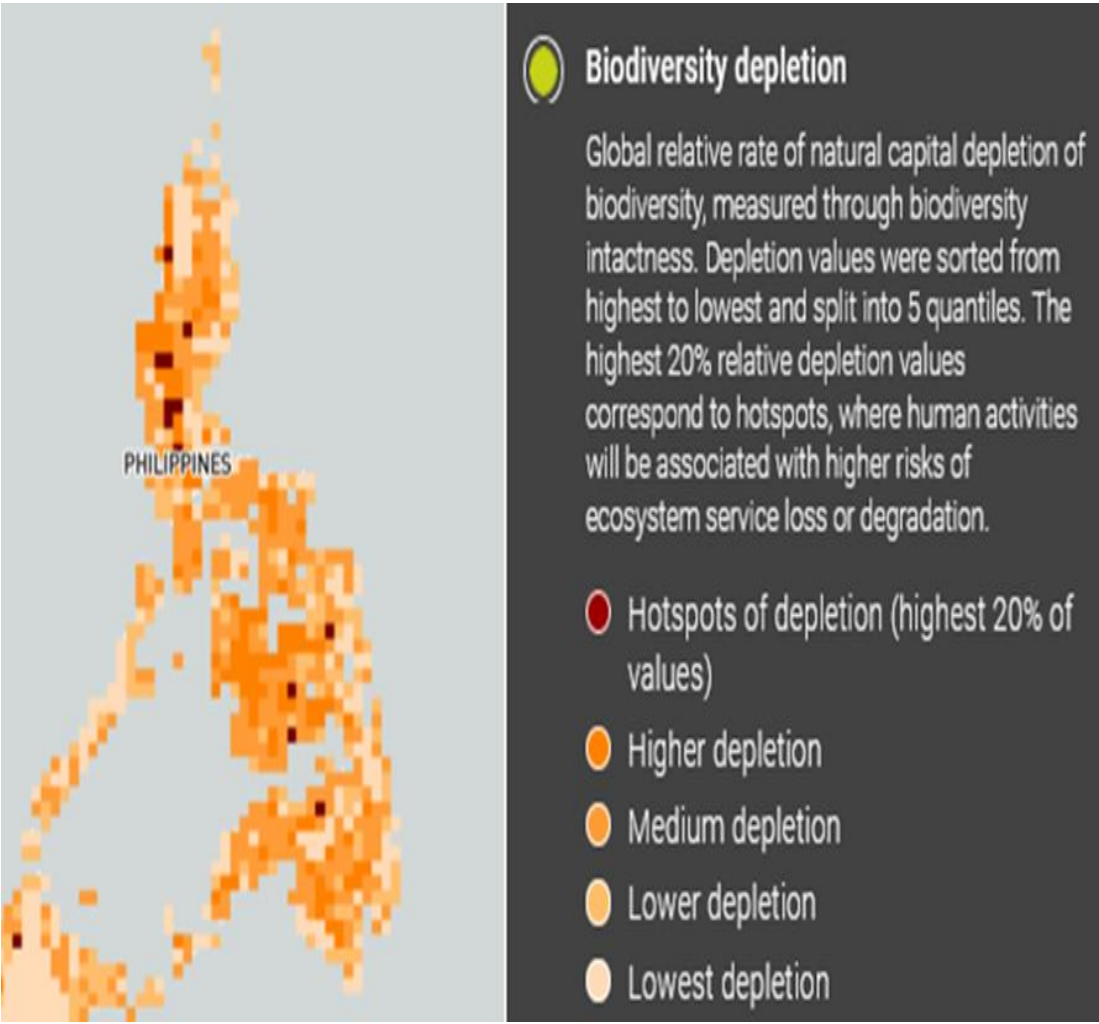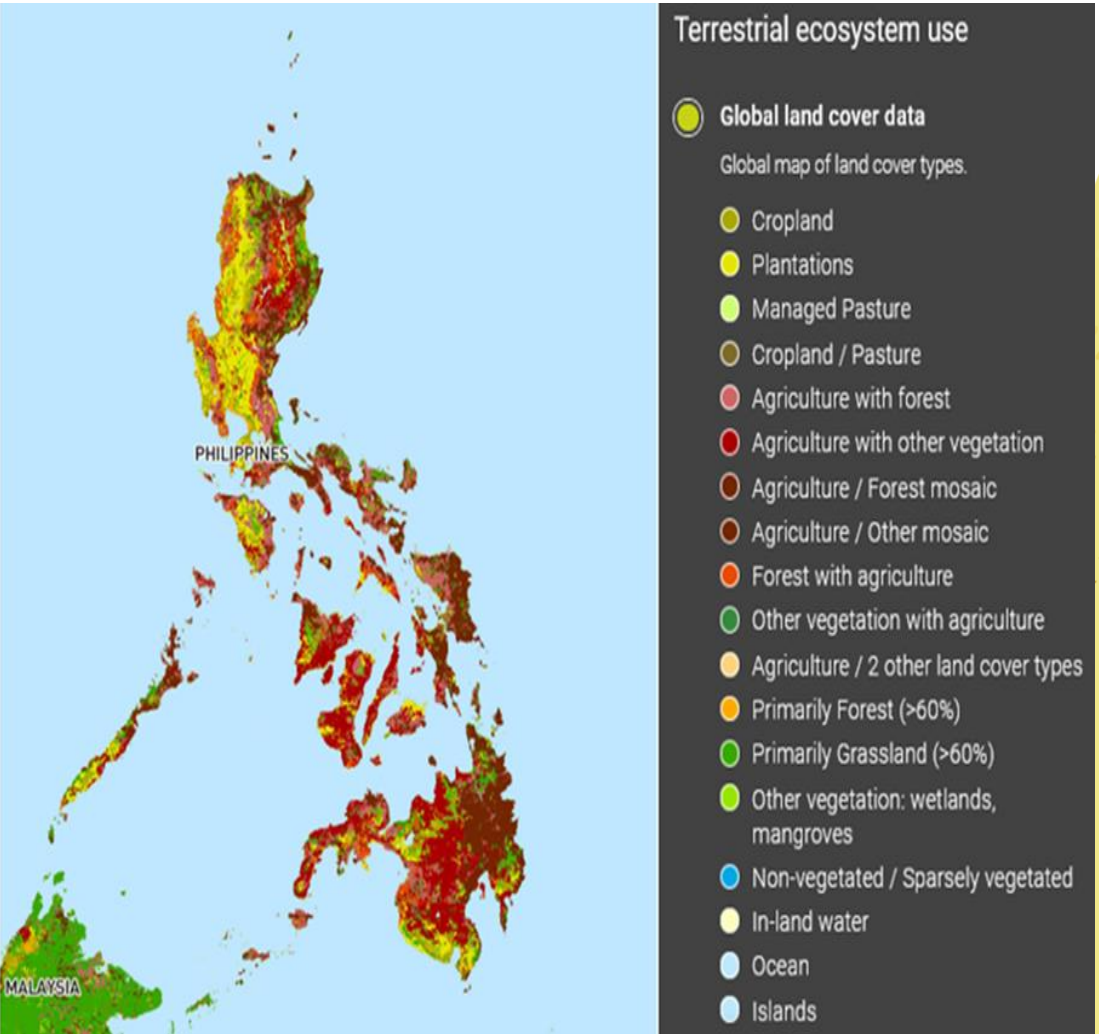**Figure 1: Biodiversity depletion in the Philippines**

Source: ENCORE

Figure 2: Terrestrial ecosystem uses in the Philippines

Source: ENCORE

5. Biodiversity depletion evident in regions (4-4)

Table 2: Regions with Hotspot, High, and Medium Probability of Biodiversity Depletion

No	Region	Region Name	Hotspot	High Depletion Rate	Medium Depletion Rate
1	NCR	National Capital Region	X		
2	CAR	Cordillera Administrative Region		X	
3	I	Ilocos	X	X	
4	II	Cagayan Valley	X		X
5	III	Central Luzon	X	X	X
6	IV-A	CALABARZON		X	X
7	IV-B	MIMAROPA		X	X
8	V	Bicol Region			X
9	VI	Western Visayas		X	X
10	VII	Central Visayas	X	X	X
11	VIII	Eastern Visayas	X		X
12	IX	Zamboanga Peninsula		X	X
13	X	Northern Mindanao	X	X	X
14	XI	Davao Region		X	X
15	XII	SOCCKSARGEN		X	X
16	XIII	CARAGA		X	X
17	BARMM	Bangsamoro Autonomous Region in Muslim Mindanao		X	

Source: ENCORE

- *Hotspots of depletion are Regions I, II, III, VII, VIII, X, NCR*

- *Largely agriculture with forest, agriculture with other vegetation, and cropland/pasture*

- *There are regions which are hotspots, with high depletion rate, and with medium depletion rate – Central Luzon, Central Visayas, Northern Mindanao*

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6. Data and Methodology (1-5)

Figure 3: From Nature-Related Risks (Including Biodiversity Loss) to Financial Risks
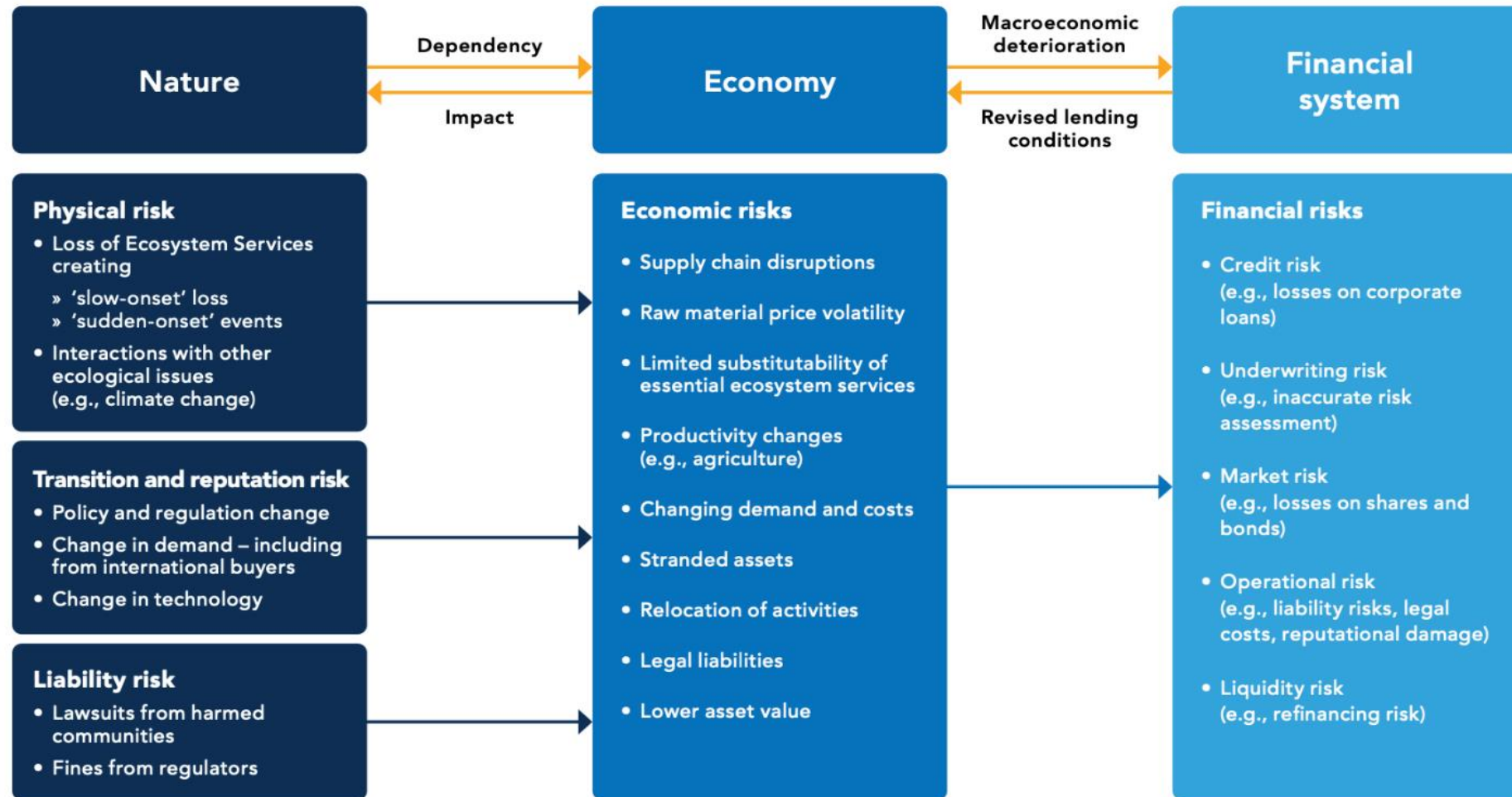
Source: WB based on van Toor et al. 2020 and Svartzman et al. 2021

6. Data and Methodology (2-5)

- Some assumptions

  - 90.4% of the total supply absorbed by domestic institutions for their production activities, final consumption and capital formation
  - Banks mobilize deposits; 58.7% of GDP financed by bank loans
  - YoY growth of bank loans declining 2011-2021

- Bank solvency stress-test using bank level loans by economic activity and by region

  - Credit stress test impose a 20% and a 50% write-off on the net carrying amount of loans and investments
  - Focus on bank loans by economic activity and by regions
  - Focus on bank loans to AFF, hotels & restaurants
  - Use biodiversity depletion rate in UNEP-WCMC Report (2021) for the Philippines as a shock for credit risk and its impact on U/KB-level solvency

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6. There are some limitations though (3-5)

- Presentation of results of stress test over a historical period only meant to see the variation of the impact
- Direct exposures of banks to biodiversity loss are yet to be determined
- Not all financial risks are analyzed due to limitation of data
- Estimates focus only on a portion of environmental risk dimension of Environmental, Social, and Government (ESG) for sustainable development
- Results represent a lower boundary estimate for total exposure
  - "Indirect impacts" or "spillovers" among economic sectors" regions or interaction between disaster or extreme events and biodiversity loss are excluded

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6. Data and Methodology (4-5)

Table 3: Regions with Hotspot, High, and Medium Probability of Biodiversity Depletion and Assumed Weighted Impact on Outstanding Loans of Universal/Commercial Banks [1]

No	Region	Region Name	Share of Outstanding Loans to Total Loans (%)	Scenario 1: Medium Depletion Rate (10%)	Scenario 2: High Depletion Rate (15%)	Scenario 3: Hotspot (20%)	Total Impact (%)
1	NCR	National Capital Region	86.9			17.4	17.4
2	CAR	Cordillera Administrative Region	0.2		0.0		0.0
3	I	Ilocos	0.5		0.0	0.01	0.01
4	II	Cagayan Valley	0.5	0.0		0.01	0.01
5	III	Central Luzon	2.0		0.0	0.01	0.01
6	IV-A	CALABARZON	1.9	0.0	0.00		0.0
7	IV-B	MIMAROPA	0.3	0.0	0.0		0.0
8	V	Bicol Region	0.4	0.0			0.0
9	VI	Western Visayas	1.0	0.0	0.0		0.0
10	VII	Central Visayas	3.0	0.0	0.01	0.01	0.2
11	VIII	Eastern Visayas	0.4	0.0		0.01	0.01
12	IX	Zamboanga Peninsula	0.2	0.0	0.0		0.0
13	X	Northern Mindanao	0.6	0.0	0.00	0.0	0.0
14	XI	Davao Region	1.3	0.0	0.0		0.0
15	XII	SOCCSARGEN	0.8	0.0	0.0		0.0
16	XIII	CARAGA	0.2		0.0		0.0
17	BARMM	Bangsamoro Autonomous Region in Muslim Mindanao	0.02		0.0		0.0

Scenario 1: Assumes 10% decline in bank loans (medium depletion rate)

Scenario 2: : Assumes 15% decline in bank loans (high depletion rate)

Scenario 3: Assumes 20% decline in bank loans (hotspot)

* National Capital Region with highest assumed weighted impact

[1] *The impact is a weighted impact based on the share of each region's loans outstanding and assumed depletion rates.*
Source: ENCORE; Authors.

6. Data and Methodology

Credit risk stress test

$$CRs = \frac{C_0 + Is}{RWAs}$$

Where:

- Initial Capital of each bank (C_O)

- UK/B industry with the stressed income (Is) – *20% additional provisioning*

- Stressed risk-weighted assets ($RWAs$) - *87.5% Credit RWAs (2010-2021)*

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7. Results (1-3)

- Without any adjustments in bank income, higher probability of depletion would not cause extreme bank solvency risk on its own as banks continue to post CARs above the BSP (10%) and BIS (8%) thresholds across scenarios
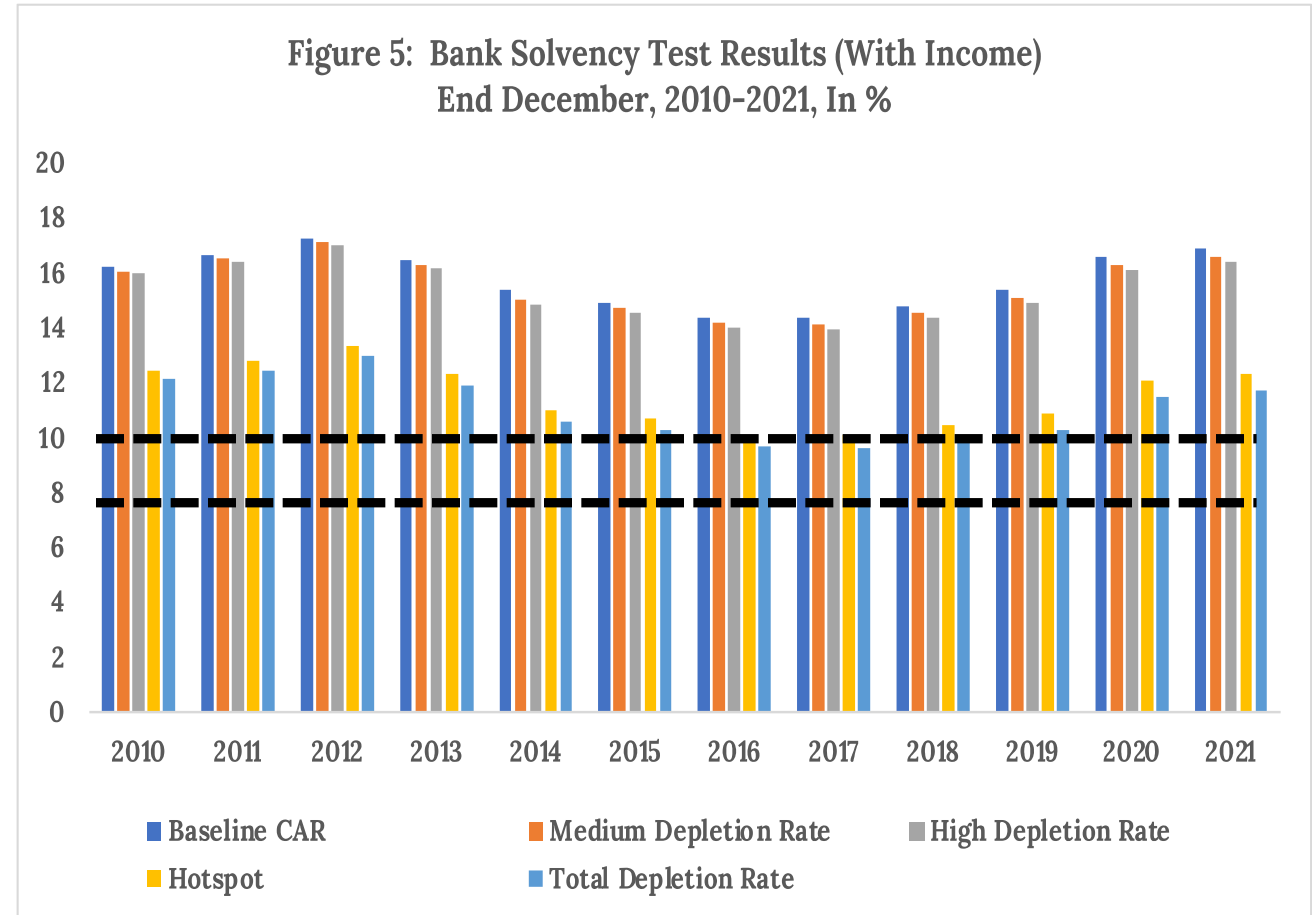

Figure 4: Bank Solvency Test Results (Without Income)
End December, 2010–2021, In %
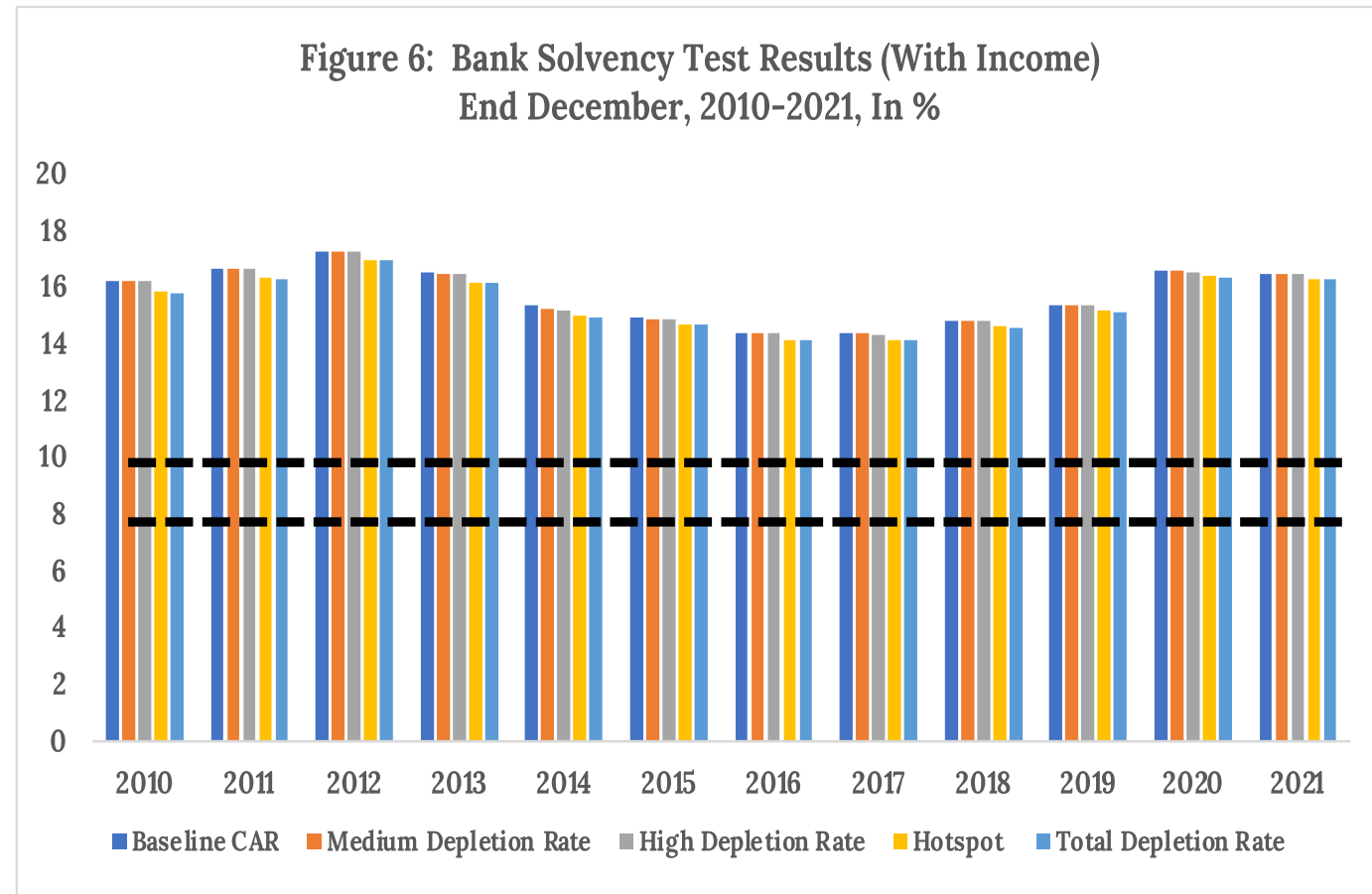
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7. Results (2-3)

- With impact on bank income, the effects of biodiversity loss remain marginal for those regions which are assumed to have medium to high biodiversity

- Impact may deepen for banks whose loan exposures to regions that are classified as hotspots (NCR)

- Bank CAR slides by 4.6 percentage points from baseline CAR in December 2021

Figure 5: Bank Solvency Test Results (With Income)
End December, 2010-2021, In %

Legend: Baseline CAR, Medium Depletion Rate, High Depletion Rate, Hotspot, Total Depletion Rate

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7. Results (3-3)

- Using weighted loans outstanding by economic activity, "total impact" on CAR remains modest at an average of 0.3 percentage point from 2010 to 2021

- Data on "indirect impact" of biodiversity loss on bank lending crucial

Figure 6: Bank Solvency Test Results (With Income) End December, 2010-2021, In %

Legend: Baseline CAR, Medium Depletion Rate, High Depletion Rate, Hotspot, Total Depletion Rate

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8. Conclusion – significant strides moving forward

- "Indirect impact" of biodiversity loss on bank lending should matter - initial results show marginal direct impact of biodiversity loss on bank solvency using simple stress test

- Stress test results subject to uncertainties at various levels - nature-related scenarios, climate model for the Philippines, macro-financial model

- More exploratory work to examine potential impact of biodiversity loss and broader natural capital depletion on bank balance sheets

- Improve data compilation and monitoring - specific exposure of individual banks to biodiversity loss or depletion of natural capital

- Supervisory authorities may ensure that nature-related financial risks, including biodiversity loss, are properly defined

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Thank you

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