

# DGE–CRED Practical Session 2: Implementation of storms, land loss and labour productivity losses

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On behalf of:



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of the Federal Republic of Germany

## Task 1: Calibration workbook and the Baseline scenario.

- Use the CreateRawExcelInputFileRobust.m in the function folder.
- Sectors and subsectors are: Agriculture, forestry and fishing; Industry; Services
- Region: Vietnam
- Climate variables regional: surface temperature (tas), storms (storms)
- Climate variables national: sea level (SL)
- Use the Calibration.xlsx file and copy the Sheet Data and the Baseline sheet into the ModelSimulationandCalibration3Sectorsand1Region.xlsx.
- Run the Baseline scenario.

## Task 2: Define SSP 119, 245 and 585 scenario.

- Create three scenarios called SSP119, SSP245 and SSP585.
- Use the ClimateVariables.xlsx file.
- Copy temperature, storms and sea level to the respective sheet.
- Run the scenarios.

## Task 3: Include damages to labour productivity in all scenarios.

Sub-sector	Description	Physical intensity (W)	Productivity reduction ( $D_s^{N,Heat}$ in $\frac{\%}{^{\circ}C}$ )
Agriculture, forestry and fishery	Heavy physical work	400	5.71
Industry	Moderate physical work	300	2.38
Services	Clerical/light physical work	200	0.35

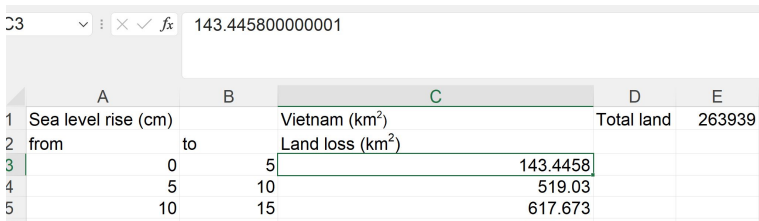
Source: Kjellstrom et al. 2019 Table 6.43 and own computation.

## Task 4: Illustrate the impact of labour productivity on GDP and its components.

- What is the impact on GDP, consumption and investment in the SSP 119, 245 and 585 scenario?
- Use the Figures.xlsx file to create the graph.

## Task 5: Land loss due to sea level rise in Agriculture, forestry and fishery.

- First, copy the existing SSP scenarios and call them SSP119Lab, SSP245Lab and SSP585Lab.
- Include land loss in agriculture, forestry and fishery such that it reduces total factor productivity in the sector as a share of total land used in the sector.
- Use the VLOOKUP function to make the land loss conditional on the respective sea level rise.
- You can find the required data in the LandLossAgricultureForestryFishery.xlsx file.



The screenshot shows an Excel spreadsheet. The formula bar at the top displays the formula `=VLOOKUP(143.4458, A3:E3, 2, FALSE)` in cell C3. Below the formula bar is a table with the following data:

	A	B	C	D	E
1	Sea level rise (cm)		Vietnam (km <sup>2</sup> )	Total land	263939
2	from	to	Land loss (km <sup>2</sup> )		
3	0	5	143.4458		
4	5	10	519.03		
5	10	15	617.673		

## Task 6: How important are land losses for the GDP effect?

- Run the SSP scenarios with the land loss effect.
- Create a suitable graph to investigate the additional GDP effect due to land losses.

## Task 7: Implement damages to the capital stock of the industry.

- Implement damages to the capital stock in the industry in Vietnam.
- The average value of capital in the manufacturing sector is  $2634 \frac{\text{billion VND}}{\text{km}^2}$ .



## Task 8: Implement damages caused by storms to housing.

- Implement damages to housing caused by storms.
- Damages caused per affected person in Vietnam by storms amounted to 890 Thousand VND per affected person.
- relative to GDP in 2018, this amounts to about  $1.3 \cdot 10^{-10}$  percentage points per year and affected person.
- Damages to houses  $exo\_DH$  is equal to the share of affected persons by storms multiplied by the number of person times  $1.3 \times 10^{-10}$ .
- Is housing destruction due to storms important for GDP reduction?

## Task 9: Conduct sensitivity analysis for damages caused by storms to housing.

- Define the scenarios SSP119stormhigh, SSP245stormhigh, SSP585stormhigh
- Replace the storm variable in the respective scenario sheets with the 95 percent value in the sheet Storms in the ClimateVariables.xlsx file.

## Task 10: Conduct sensitivity analysis for low and high values for the elasticity of substitution between different domestic sectors.

- The degree of substitutability is given by  $\frac{\eta^Q - 1}{\eta^Q}$ .
- Estimation results suggest very low values of  $\eta^Q$ .
- So far we assumed a value of  $\eta^Q = 0.01$ .
- Set the value to 10 and analyse the impact.
- What is your initial hypothesis about the GDP impact for high and low elasticity of substitution?

$$Q_t^D = \left( \sum_k^K \omega_k^{Q^A \frac{1}{\eta^Q}} Q_{k,t}^{A,D \frac{\eta^Q - 1}{\eta^Q}} \right)^{\frac{\eta^Q}{\eta^Q - 1}} \quad (1)$$