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

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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.

Sub-sector	Description	Physical intensity (W)	Productivity reduction ($D_s^{N,Heat}$ in $\frac{\%}{°C}$)
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.

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	A	B	C	D	E
1	Sea level rise (cm)		Vietnam (km^2)	Total land	263939
2	from	to	Land loss (km^2)		
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 $\frac{billion VND}{km^2}$.

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 $1.3\,10^{-10}$ 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 1.3×10^{-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 η^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?

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