CURRENT STRUCTURAL CHANGES IN ECONOMIC NETWORK AMPLIFY HEAT-STRESS-INDUCED PRODUCTION LOSSES

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BACKGROUND: REDUCED LABOR PRODUCTIVITY DUE TO HEAT-STRESS

- Labor productivity in outdoor industries declines with temperature above ~27°C [1]
- Under climate change an increase in heat-stress-induced production losses can be expected if no adaptation measures are taken

APPROACH: MODELLING HEAT-STRESS UNDER FUTURE WARMING AND PRODUCTION LOSS PROPAGATION

Direct losses from heat-stress

Population-weighted temp. time series (1991-2099)

Effect of heat-stress on labor supply as per [1]

Population (SSP 2, [2])

Multi-regional Input-Output tables [3]

Daily mean temperature (RCP 8.5, [2])

Multi-regional Input-Output tables

Population-weighted temp. time series

Supply dependencies on India (%)

2011

2001

2011

2001

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REFERENCES

4. CURRENT EVOLUTION OF ECONOMIC NETWORK’S STRUCTURE

- SPC has increased since 2001
- Losses due to this structural evolution dominate over effect of climatic changes

1. HEAT-STRESS-INDUCED PRODUCTION LOSSES

- Total production losses increase over time
- Relative losses increase with GMT
- The magnitude of losses varies with the underlying economic network

2. INDIRECT LOSSES & ROLE OF STORAGE

- Indirect production losses are significant
- They can be reduced by higher storage capacities but only to a certain extent

3. SENSITIVITY OF LOSS PROPAGATION TO ECONOMIC NETWORK

- The network’s loss sensitivity to a rise in GMT increases over time
- Relative losses correlate with SPC
- SPC is mainly due to the network’s connectivity

SUMMARY & OUTLOOK

- Heat-stress-induced production losses are likely to evoke higher-order losses
- Current evolution of economic network fosters loss propagation
- Structural adaptation with more foresight than currently prevalent required