

An Integrated Engineering-Economic Impact Assessment Model

--An Estimation of Tsunami Impacts on Clatsop County

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Presentation Overview

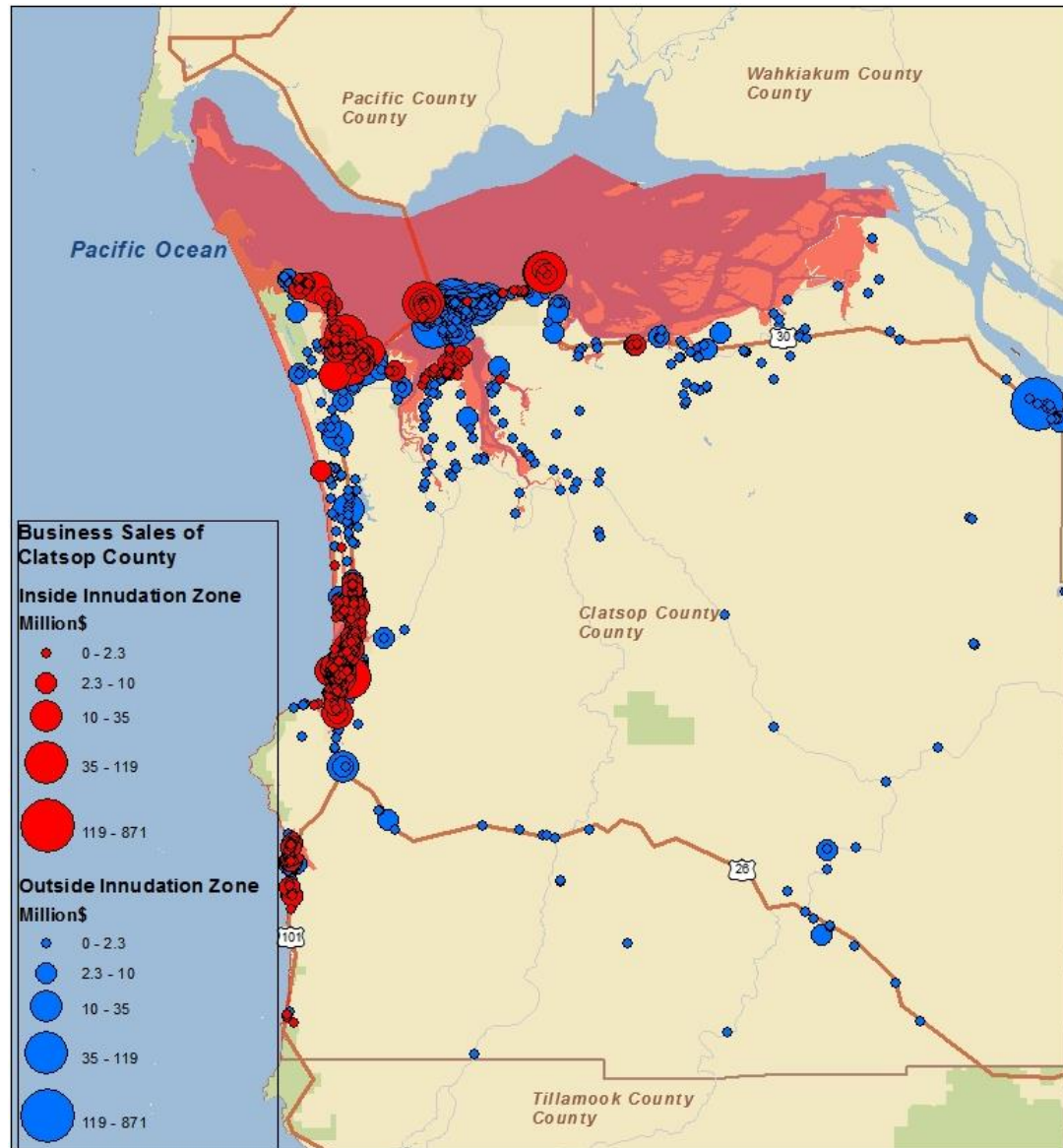
- Background
- Model Overview
- Engineering Model
- Economic Model
 - Direct Economic Impacts
 - Indirect Economic Impacts
- Engineering-Economic Integration
 - Issues
 - Method: Multi-Regional CGE
 - Result comparison: Multi-Regional CGE vs. County CGE
- Summary and Extension

Threat of Tsunami

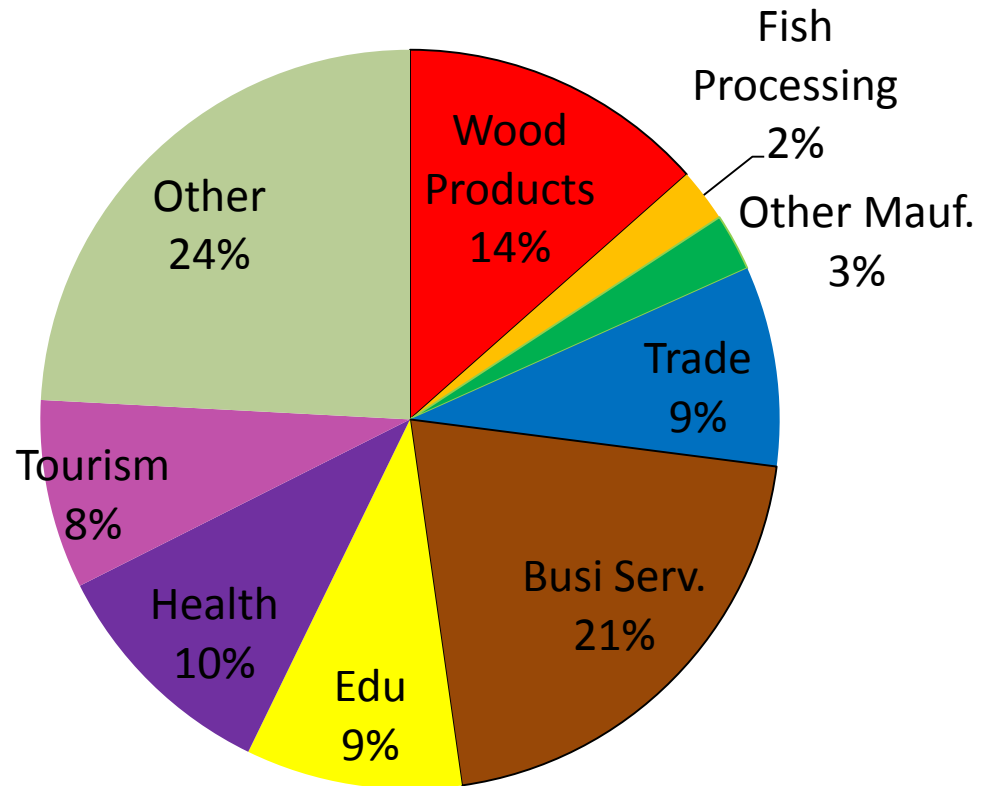
- 7-12% probability next 50 years
- 60 km from CSZ to the shoreline
- 40 min for the first wave to reach the shore



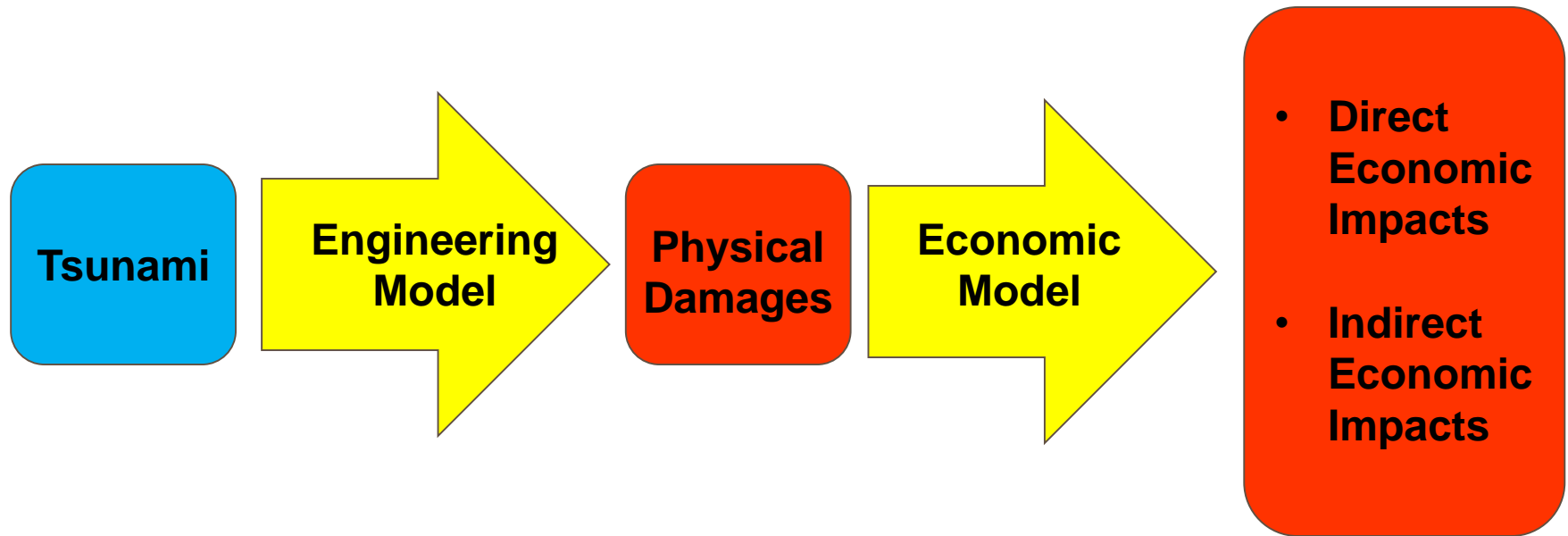
Potential Impacts



Clatsop County Economy

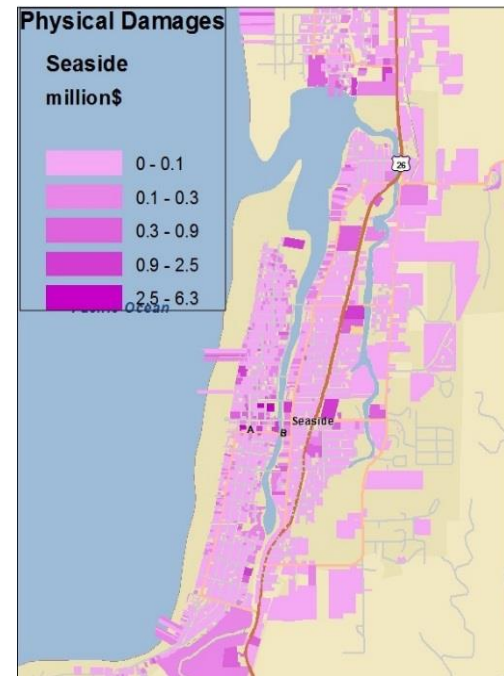
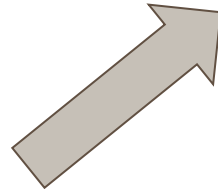
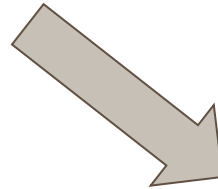
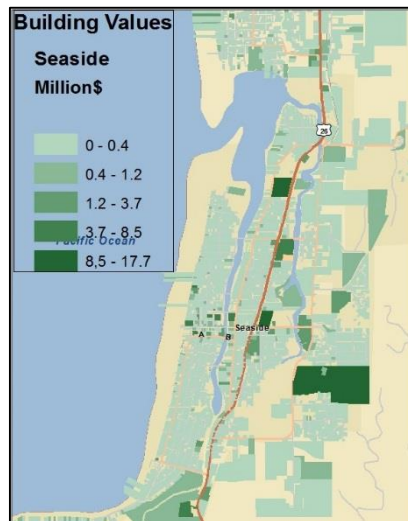
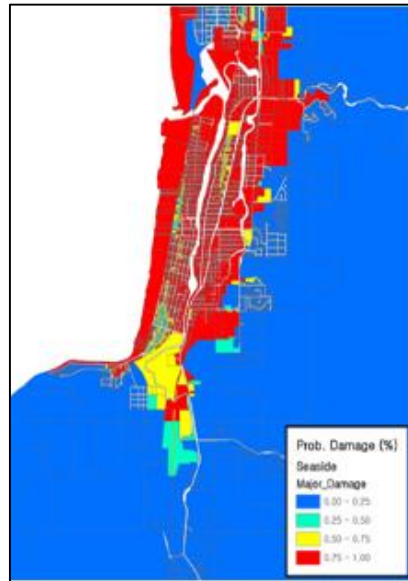


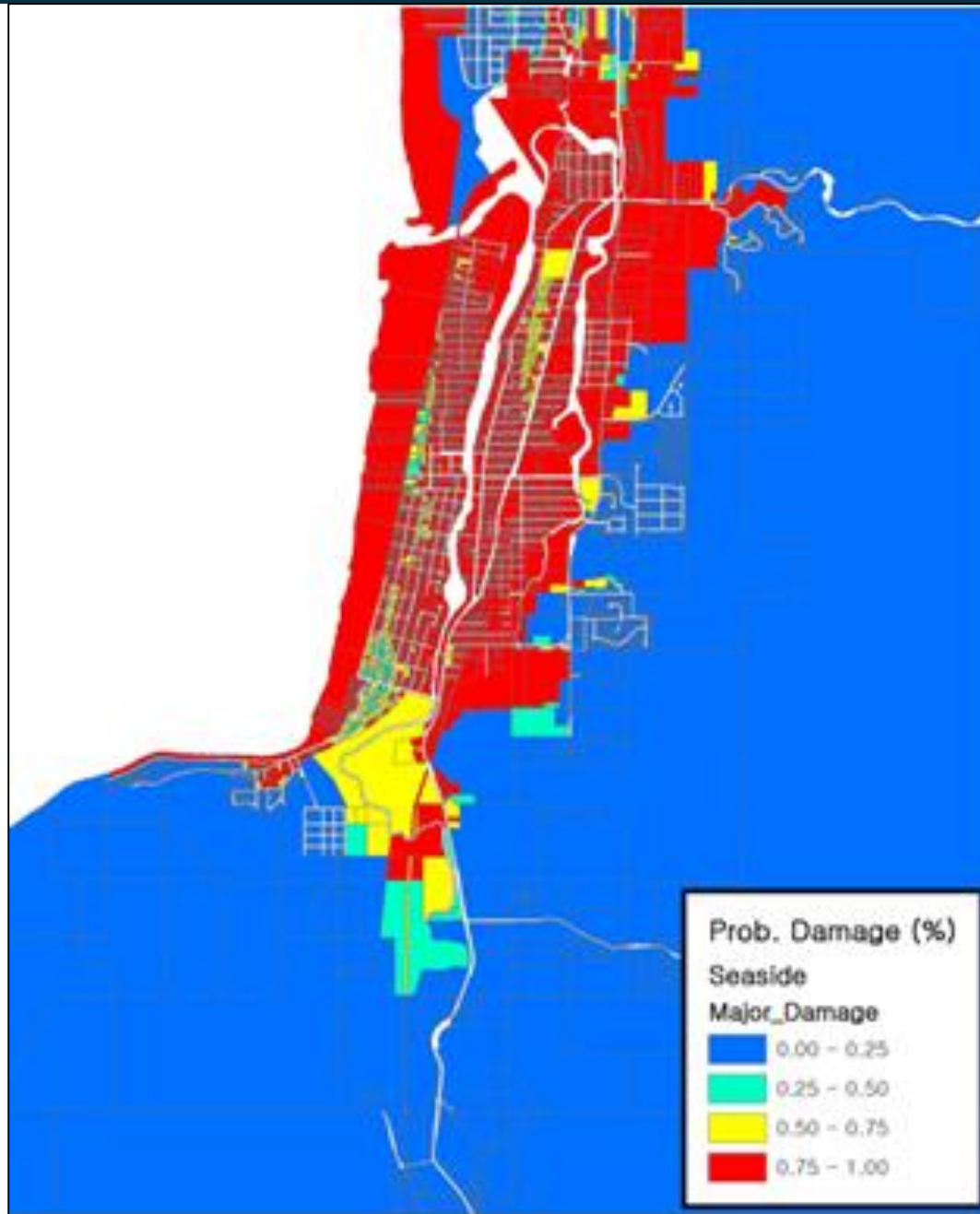
Model Overview



- Assumptions
 - No earthquake impacts
 - No life loss

Physical Damages

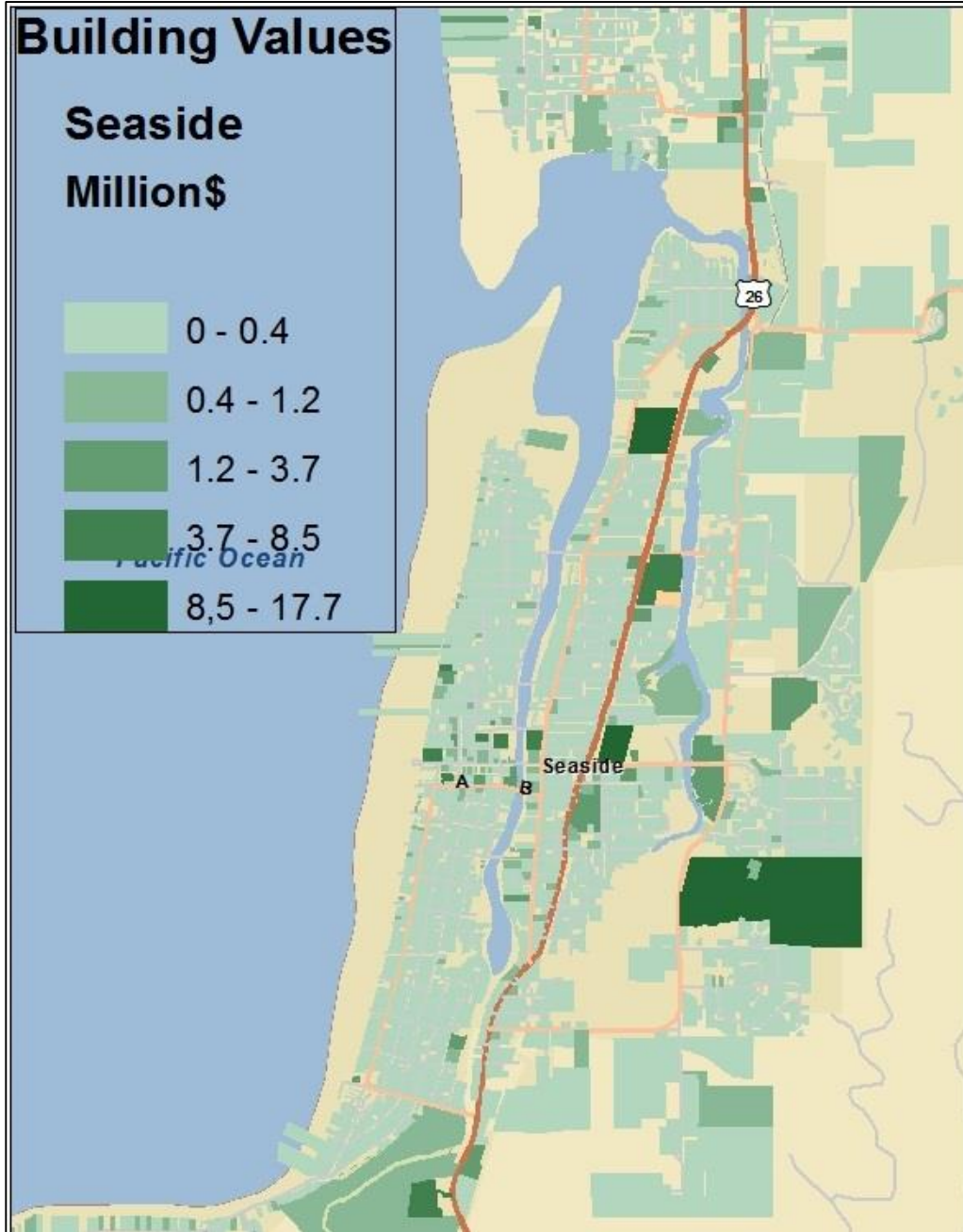
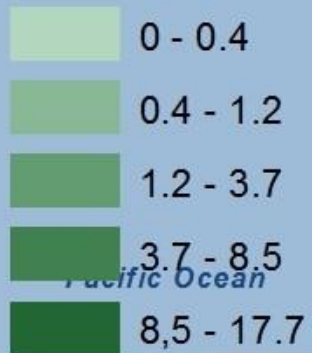




Building Values

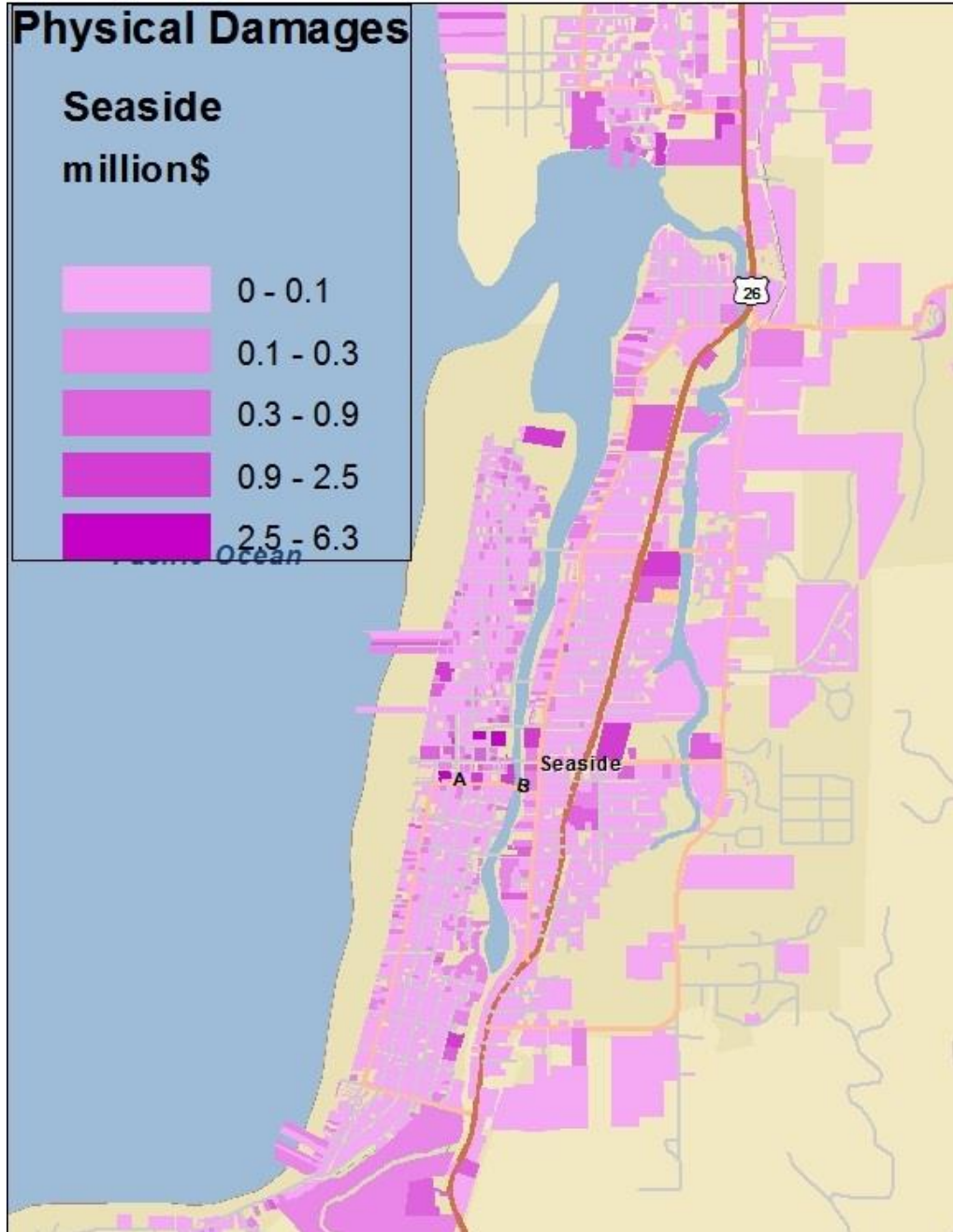
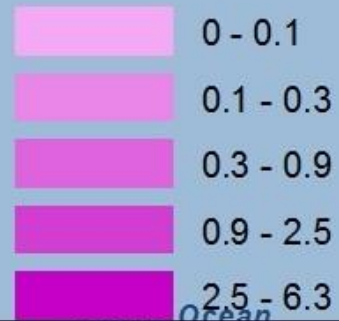
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Million\$

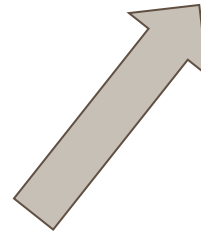
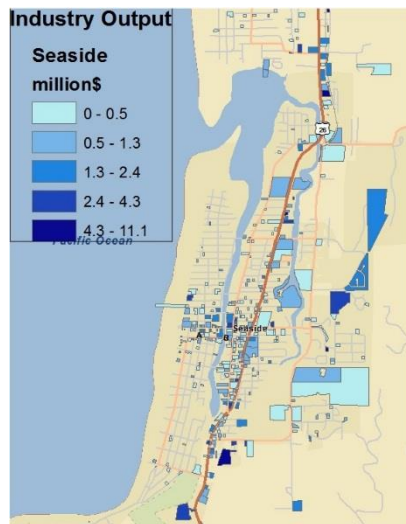
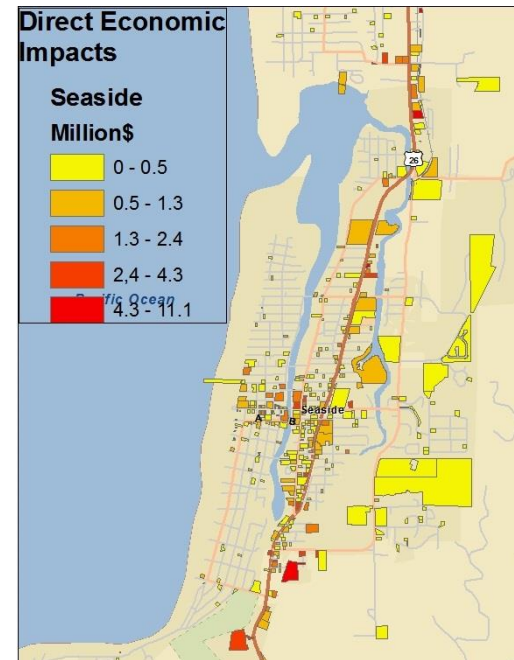
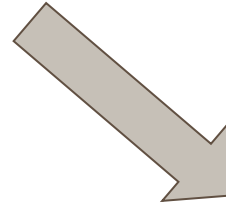
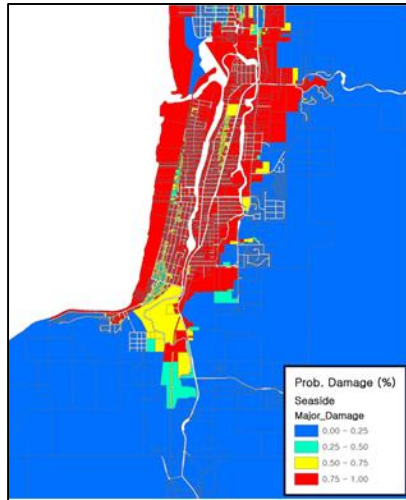


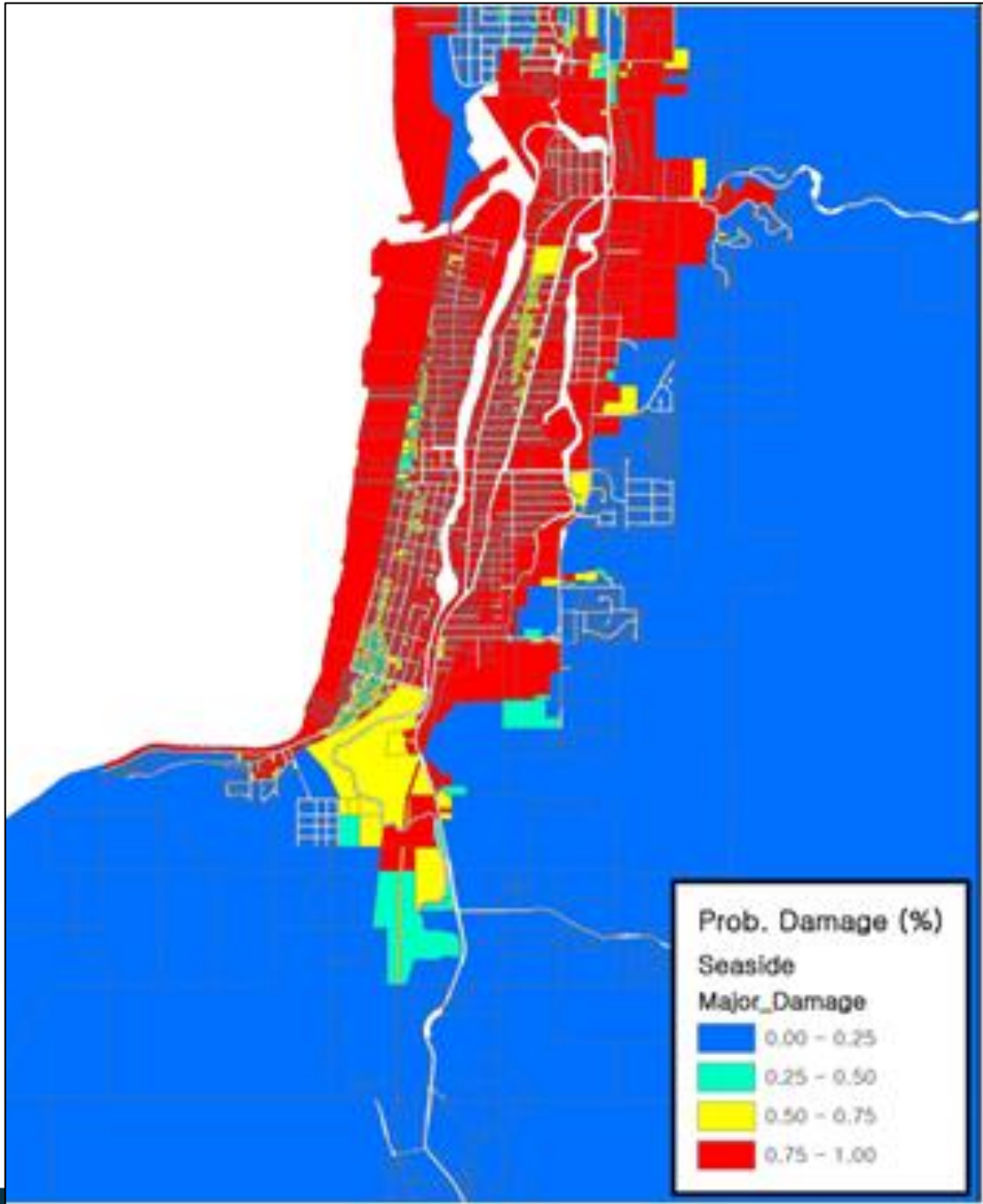
Physical Damages

Seaside
million\$



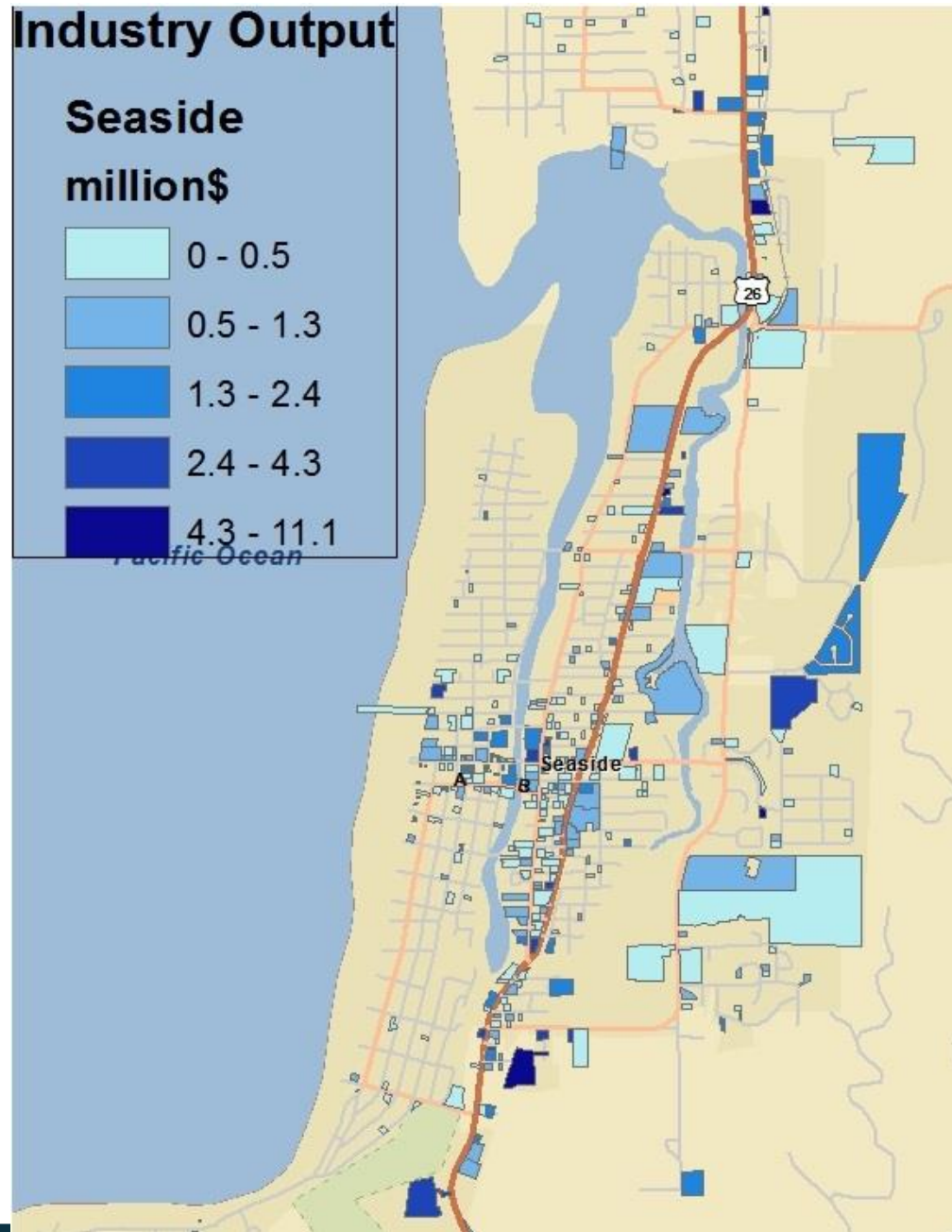
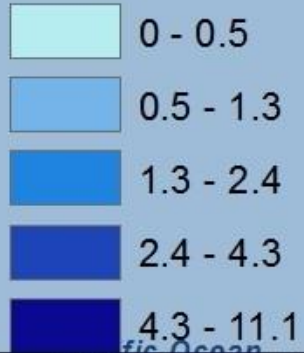
Direct Economic Impacts





Industry Output

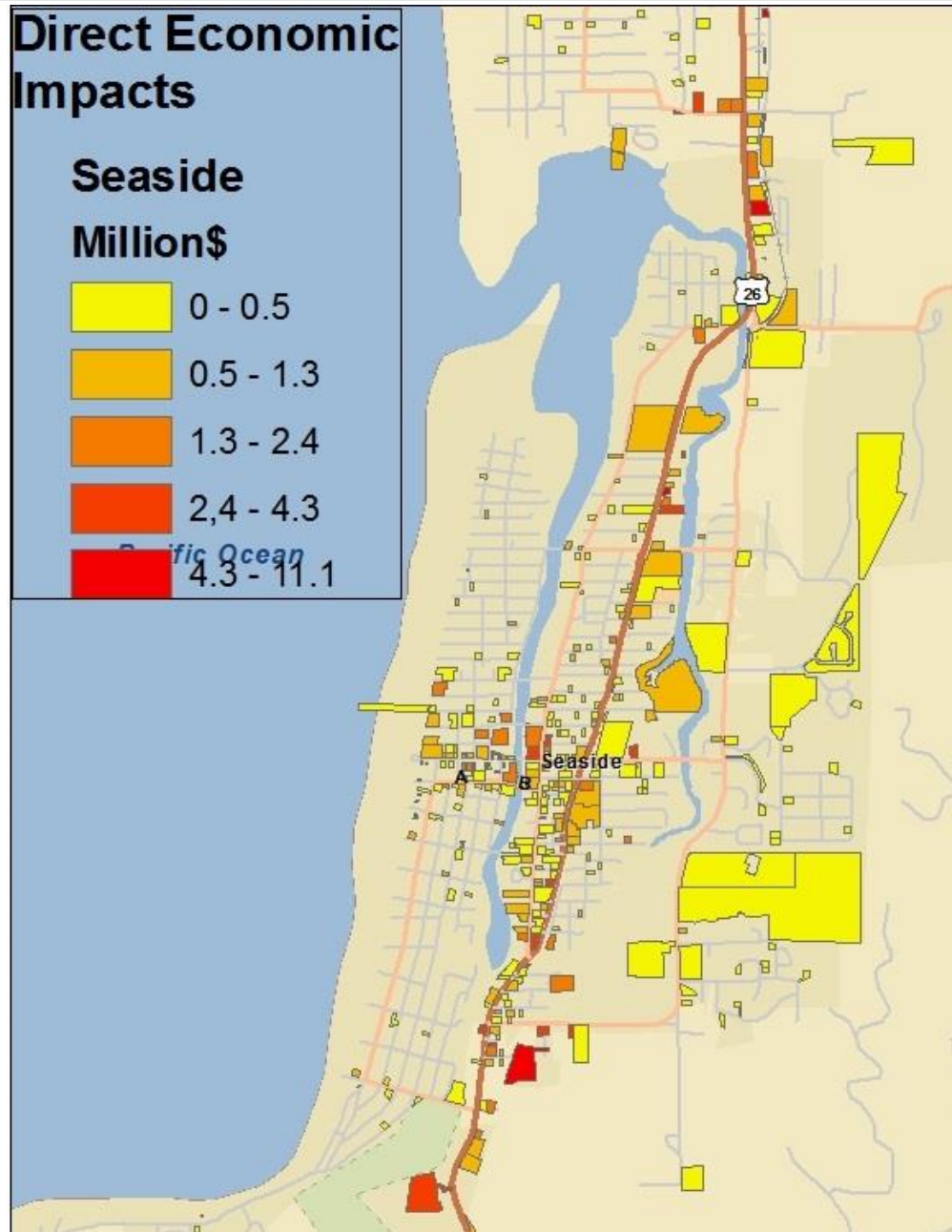
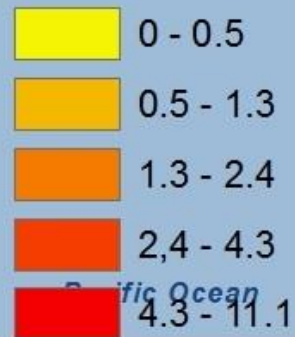
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million\$



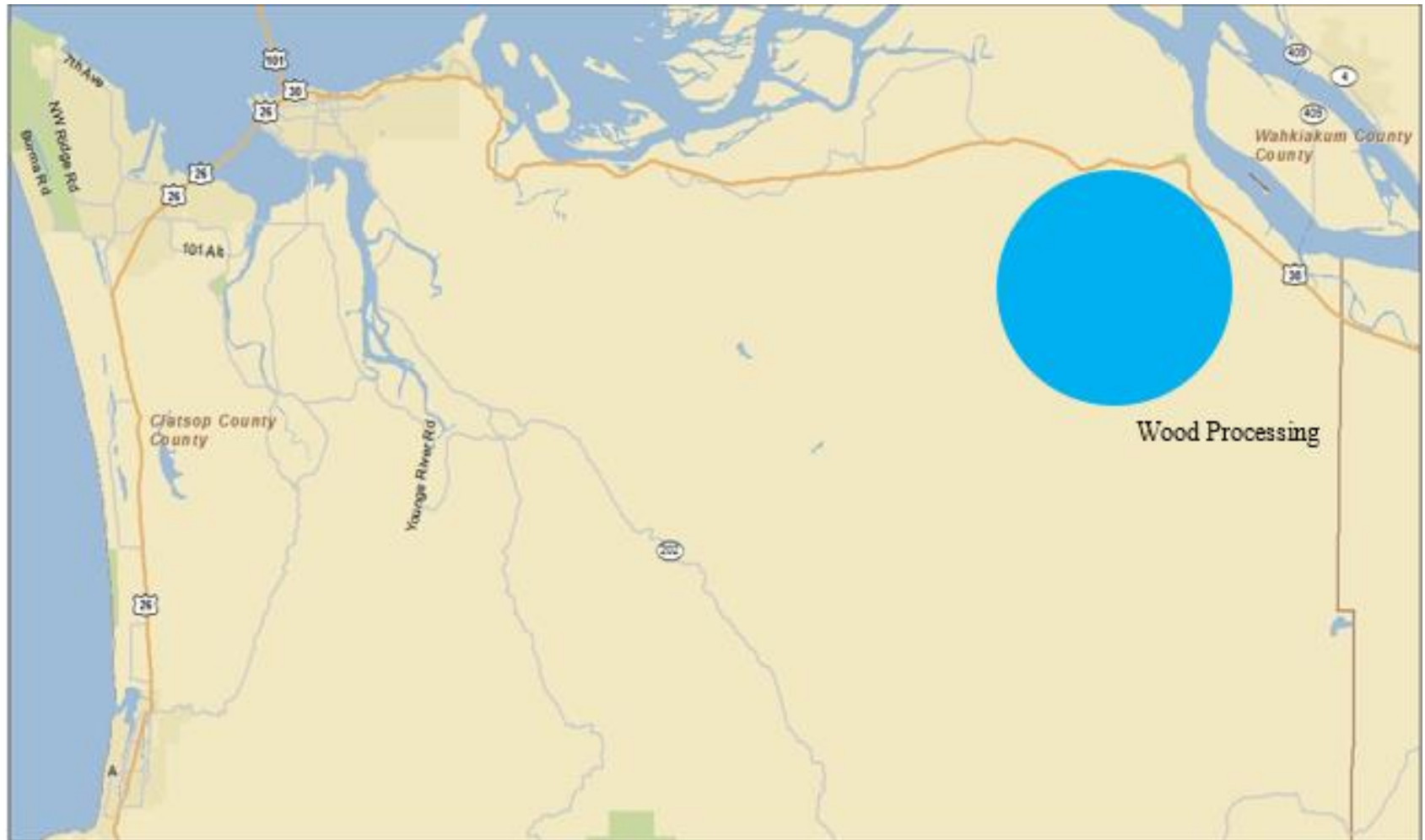
Direct Economic Impacts

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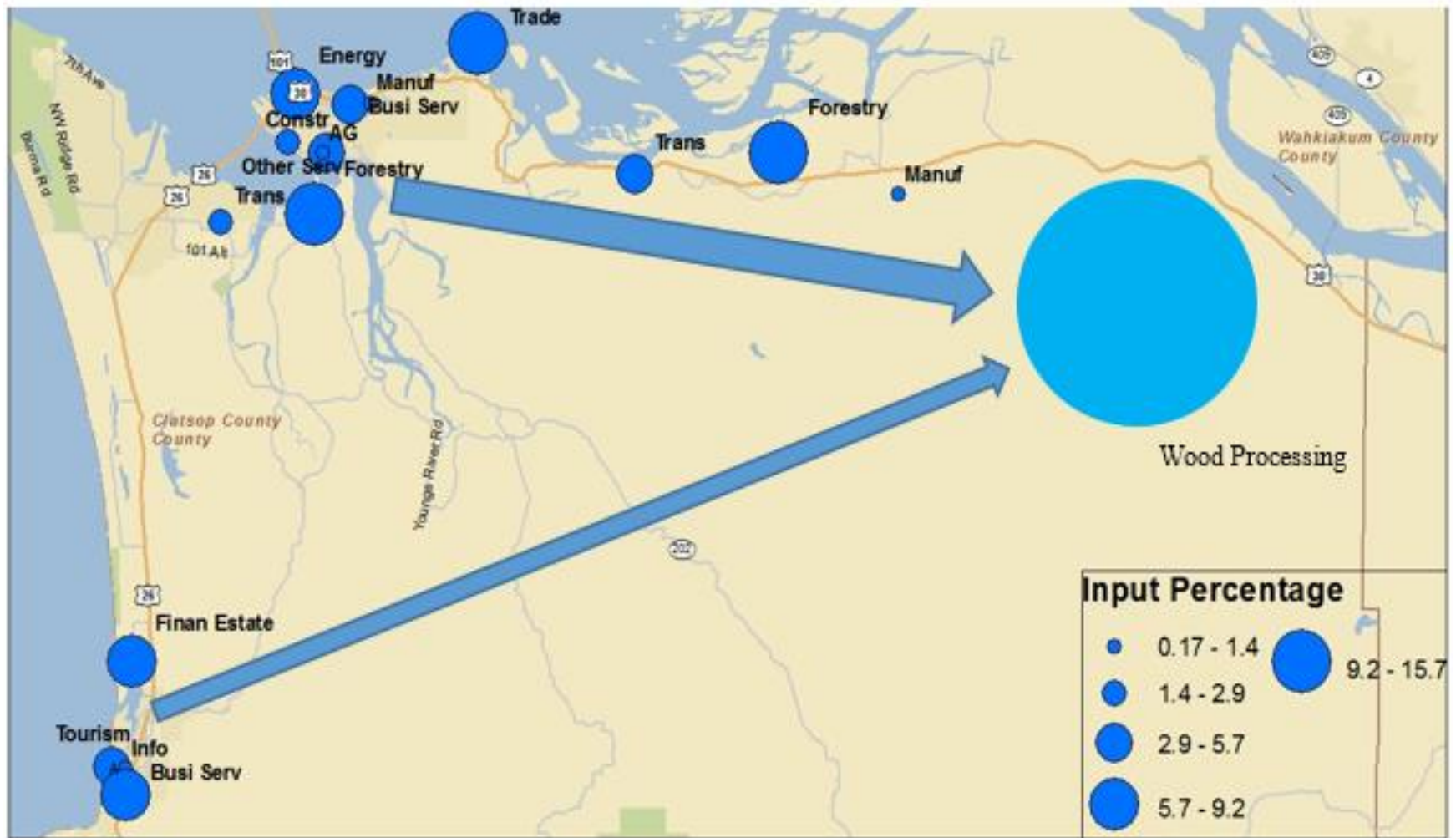
Million\$



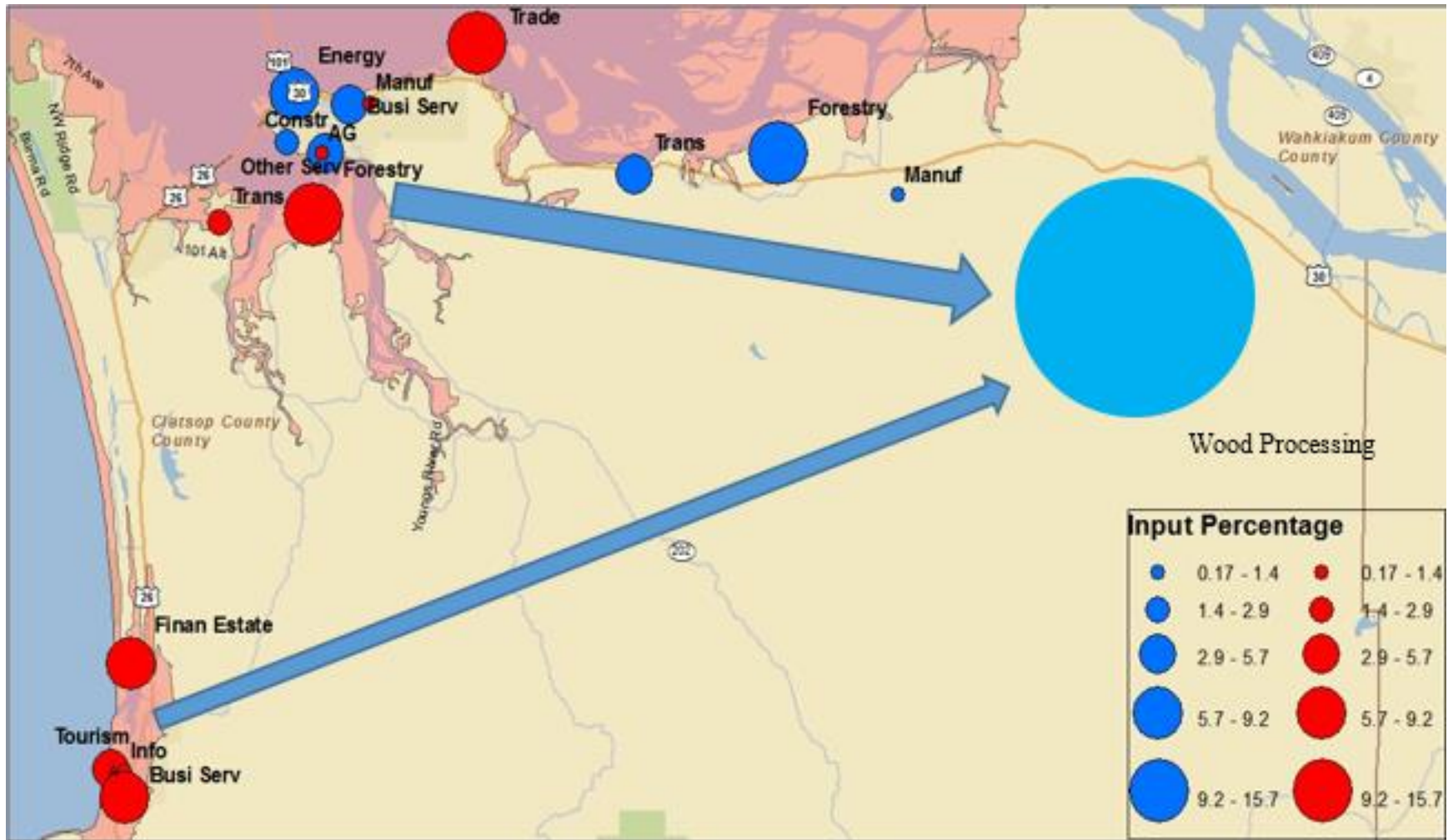
Indirect Economic Impacts: A Case of Wood Products



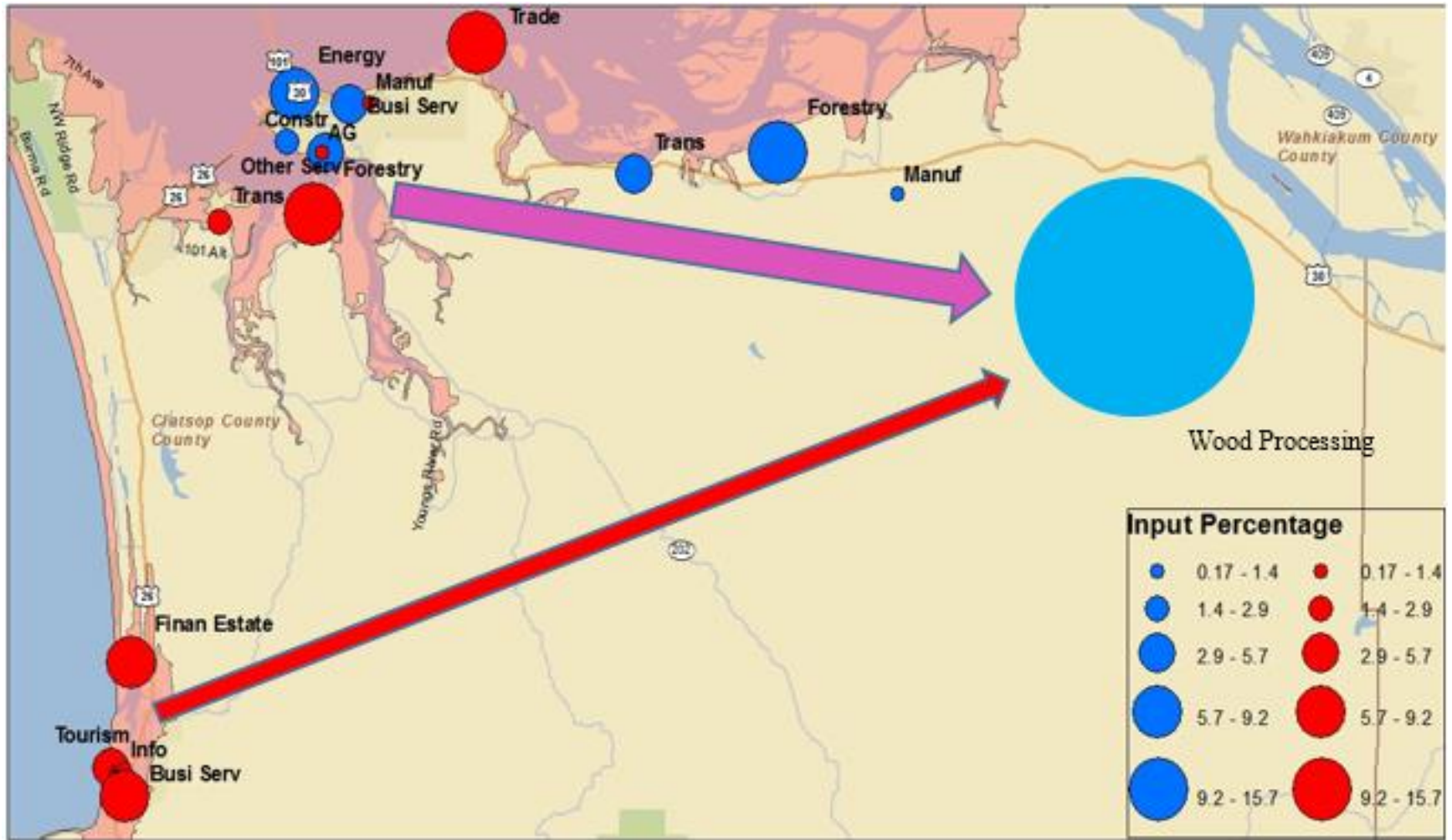
Input Suppliers



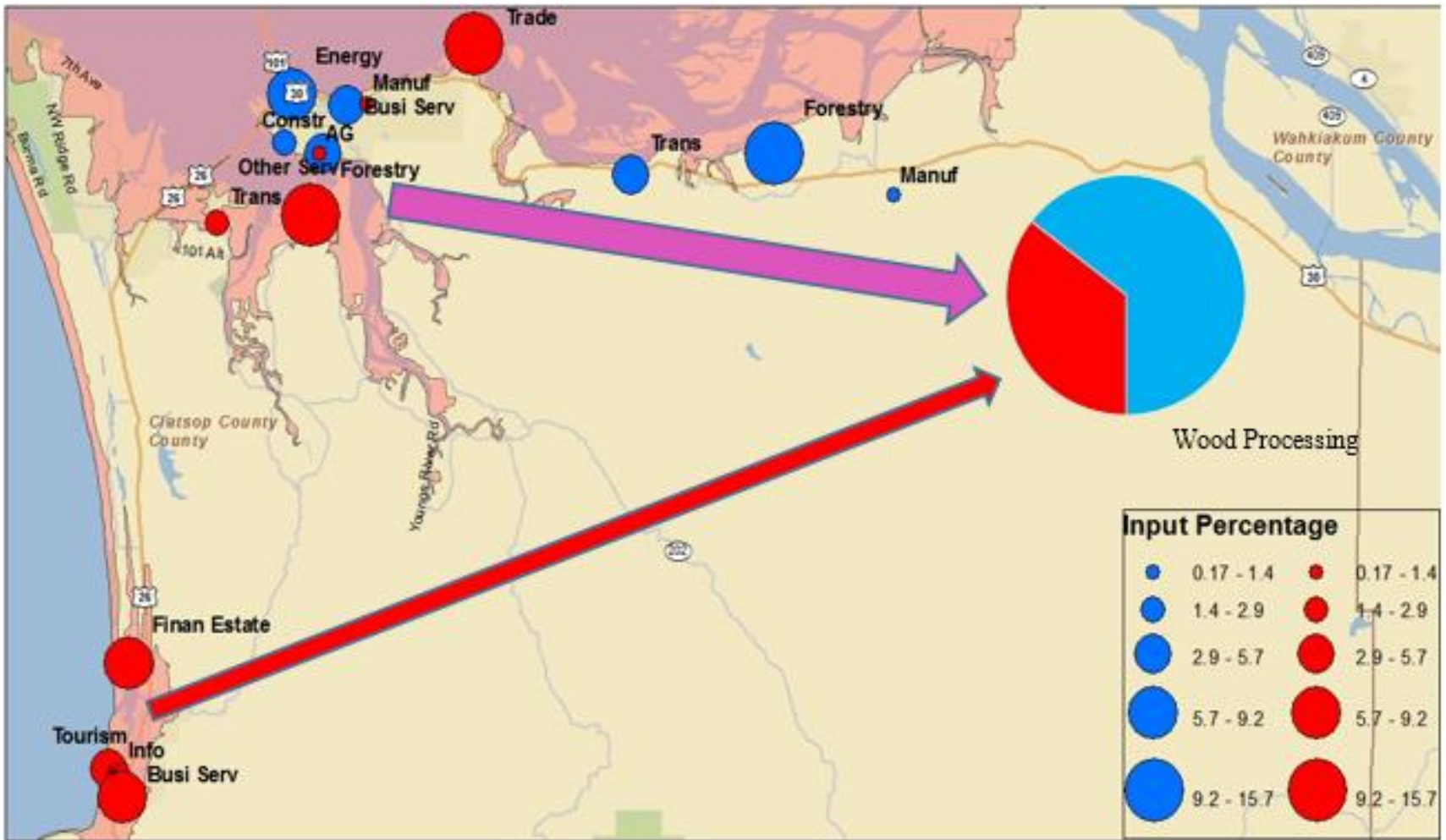
Direct Economic Impacts



Reduction of Input Supplies



Indirect Economic Impacts

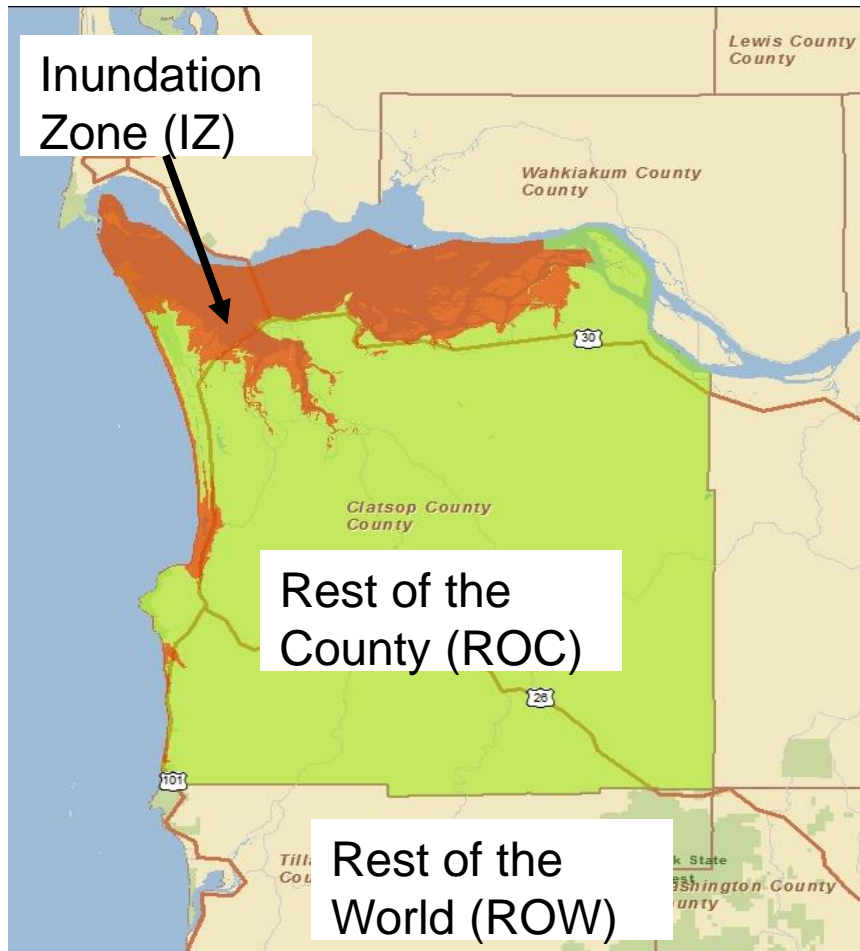


Issues of Estimating Indirect Economic Impacts

- Spatial disparities
 - Economic model: county-level economic transaction data
 - Engineering model: parcel-level damage probability
- Data mismatches
 - Economic model: sector-specific damages
 - Engineering model: non-sector specific damage probability

Method: Computable General Equilibrium (CGE)

Multi-Regional CGE



County CGE



Data

- County-level Social Accounting Matrix (SAM) from Implan
- Business location, revenue, and employment data from Taxlot map and GIS Business Analysis
- Population distribution from Census and GIS Business Analysis

Physical Damages and Direct Economic Impacts (million\$)

Sectors	Building Values	Physical Damages	Industry Outputs	Direct Economic Impacts
Wood Products	215	< -1	557	-1
Fish Processing	29	< -1	96	-4
Other Manuf.	19	-1	104	-16
Trade	331	-23	362	-66
Busi Serv.	177	-17	858	-214
Edu	144	-5	391	-111
Health	300	-3	429	-30
Tourism	374	-24	342	-163
Other	908	-14	1000	-215
Residences	3300	-282		
Total	5798	-367	4139	-820

Indirect Economic Impacts (million\$)

Sectors	County-level CGE	Multi-regional CGE
Wood Products	-15	-71
Fish Processing	-28	-41
Other Mauf.	-24	-21
Trade	-24	-49
Busi Serv.	-181	-165
Edu	3	-87
Health	-32	-112
Tourism	1	-92
Other	-42	-171
Total	-342	-808

Indirect Economic Impacts (million\$)

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Illustration: County-level CGE

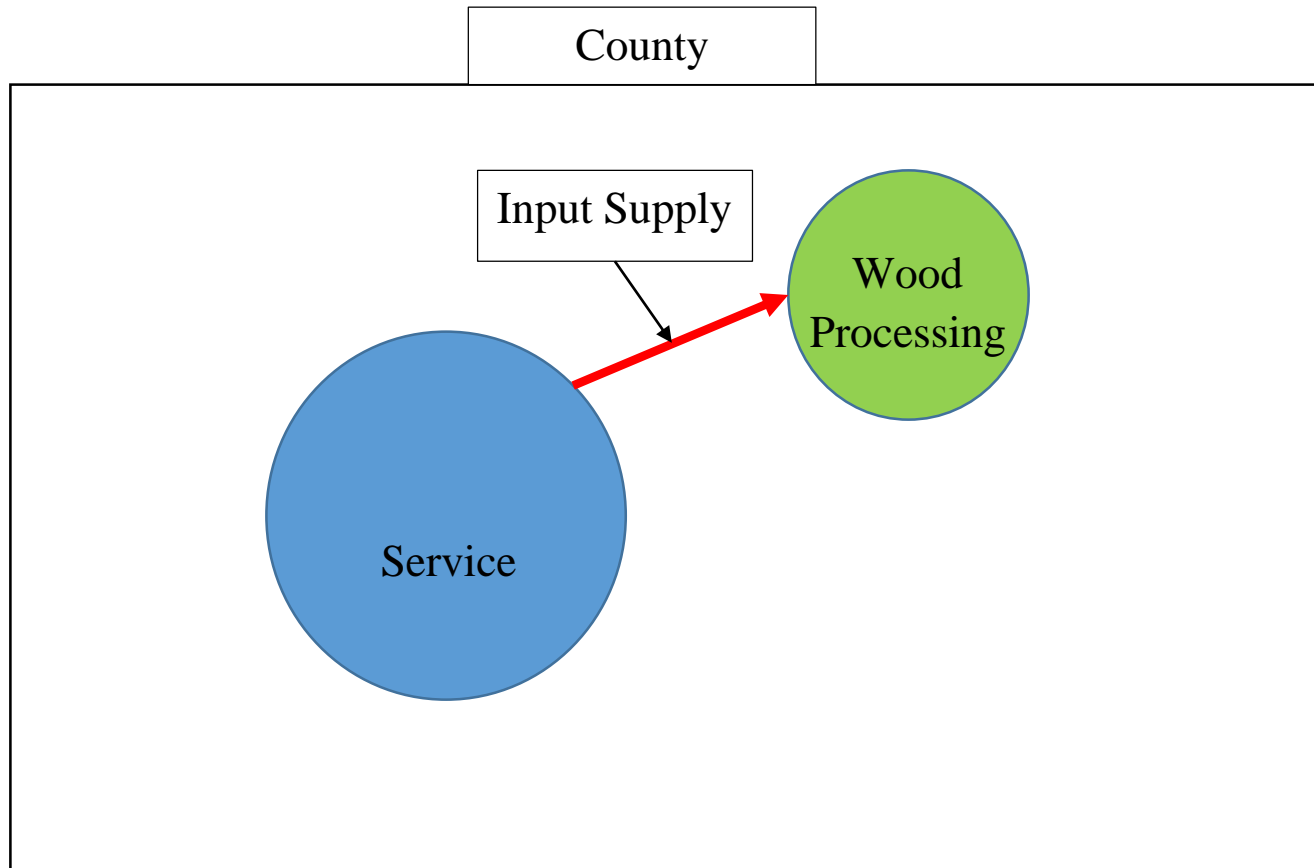


Illustration: County-level CGE

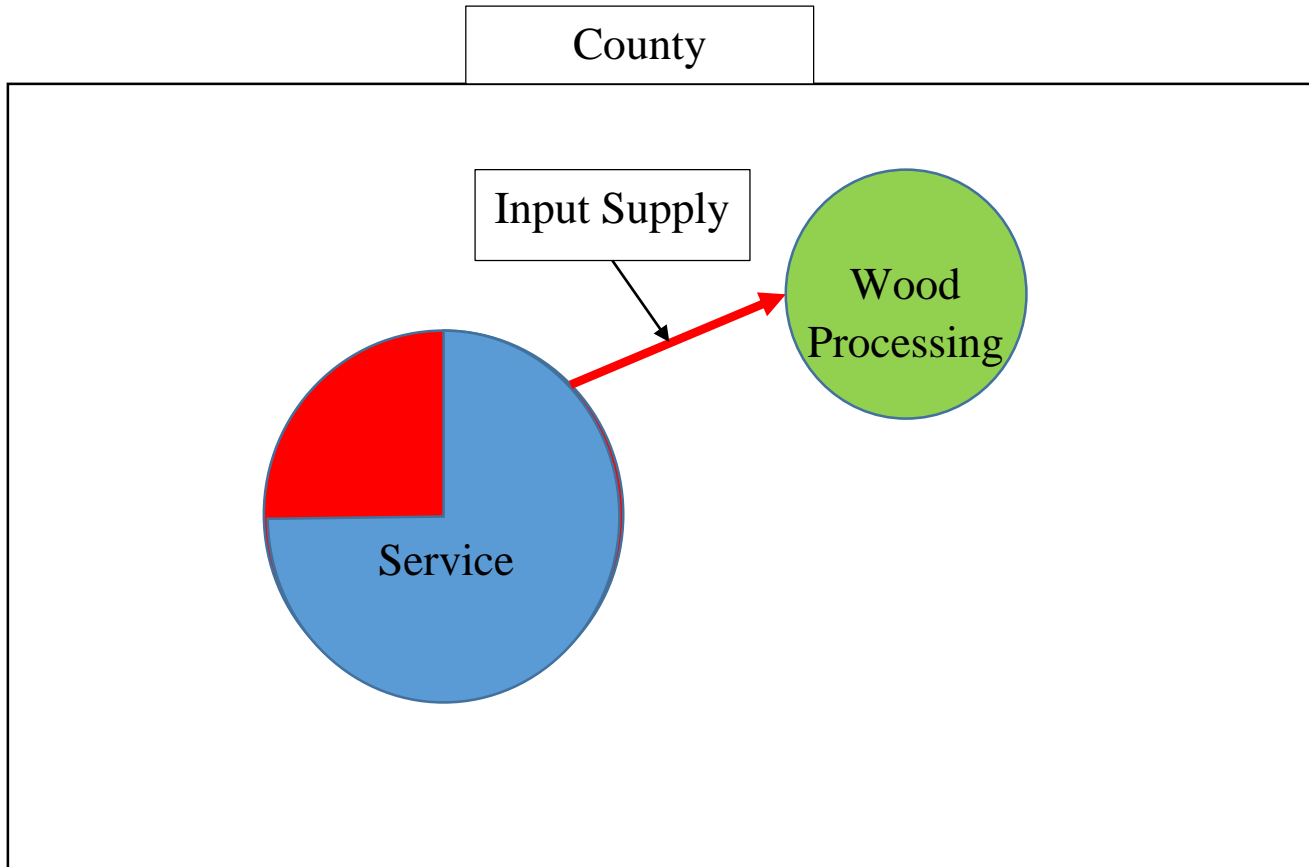


Illustration: County-level CGE

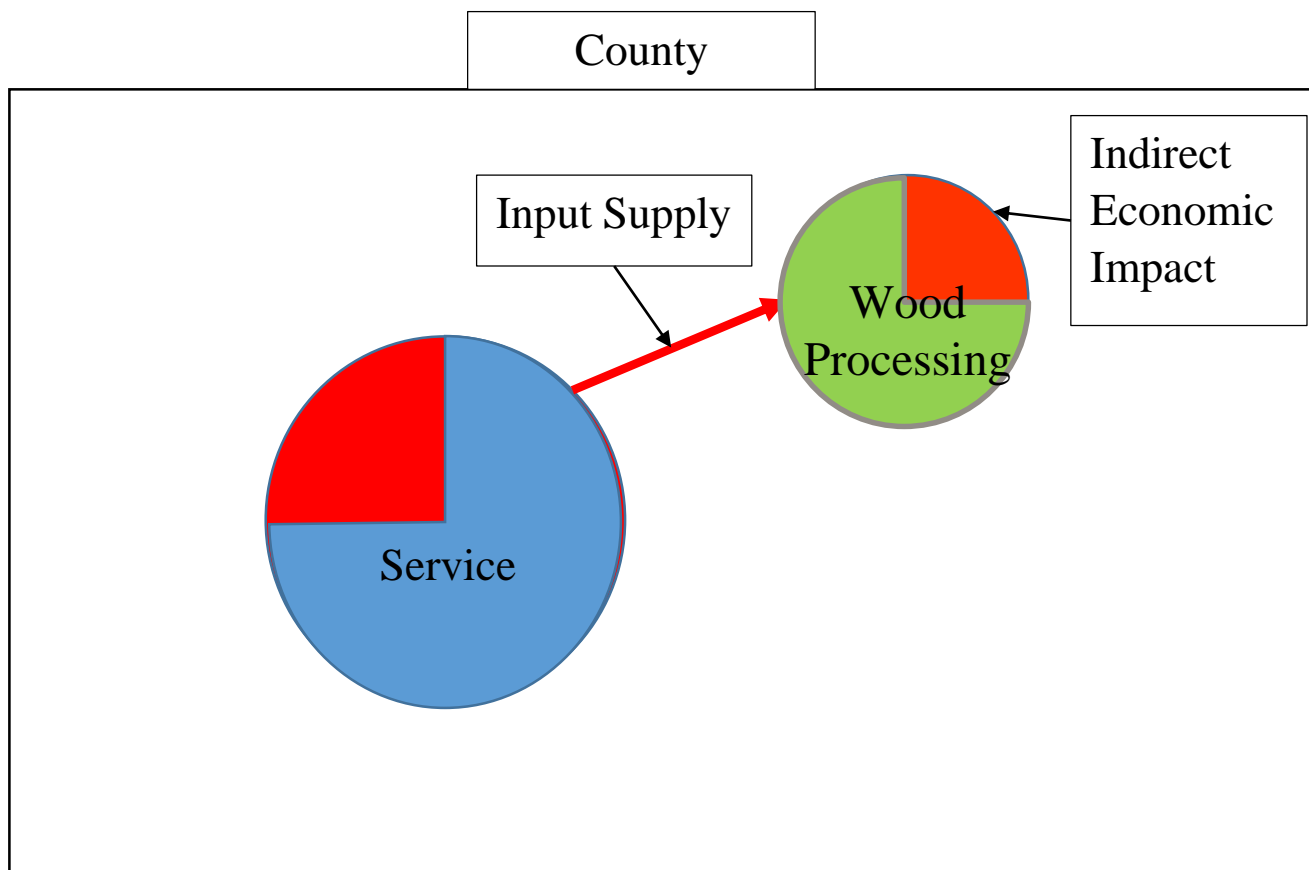


Illustration: Multi-regional CGE

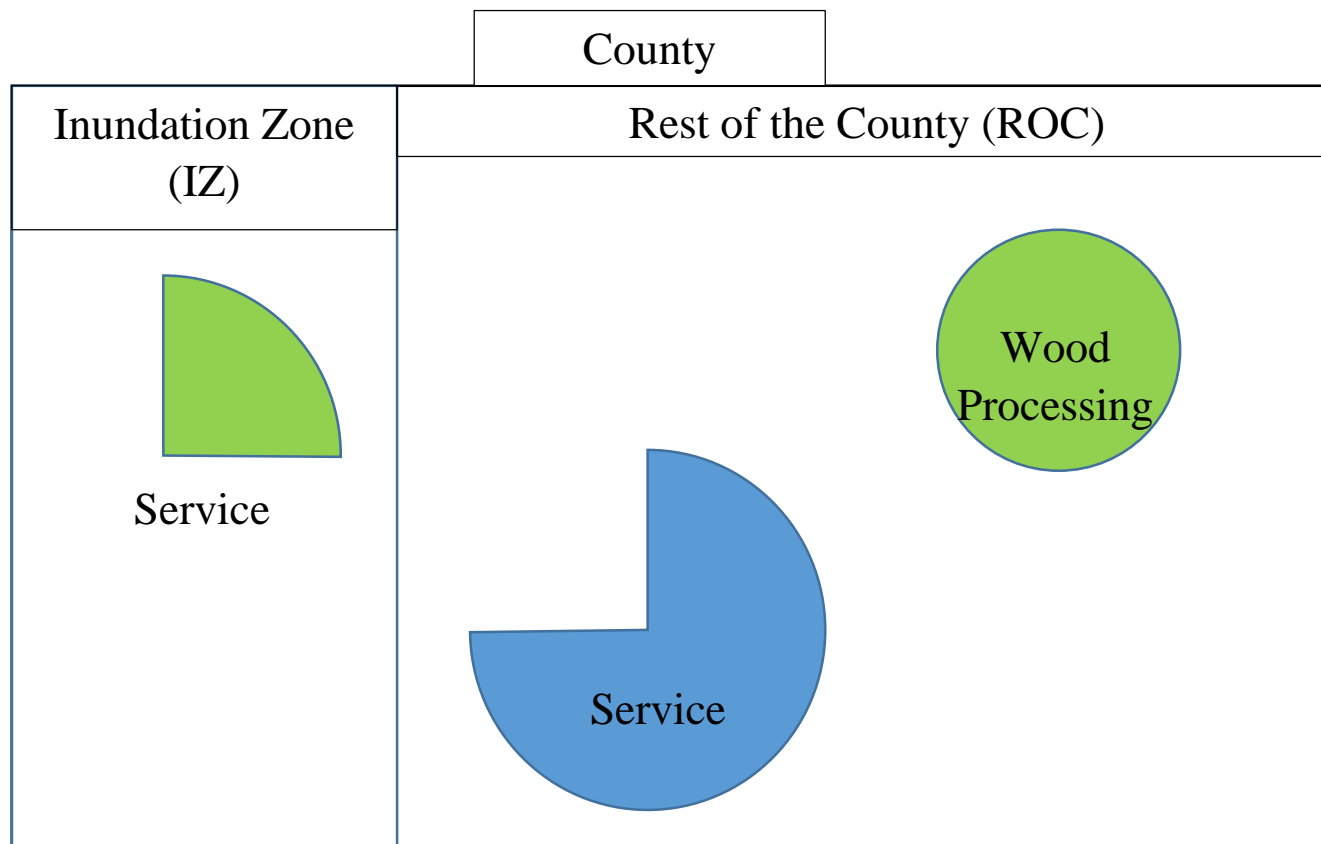


Illustration: Multi-regional CGE

- Spatial-Explicit economic transaction affect the estimation of indirect economic impacts

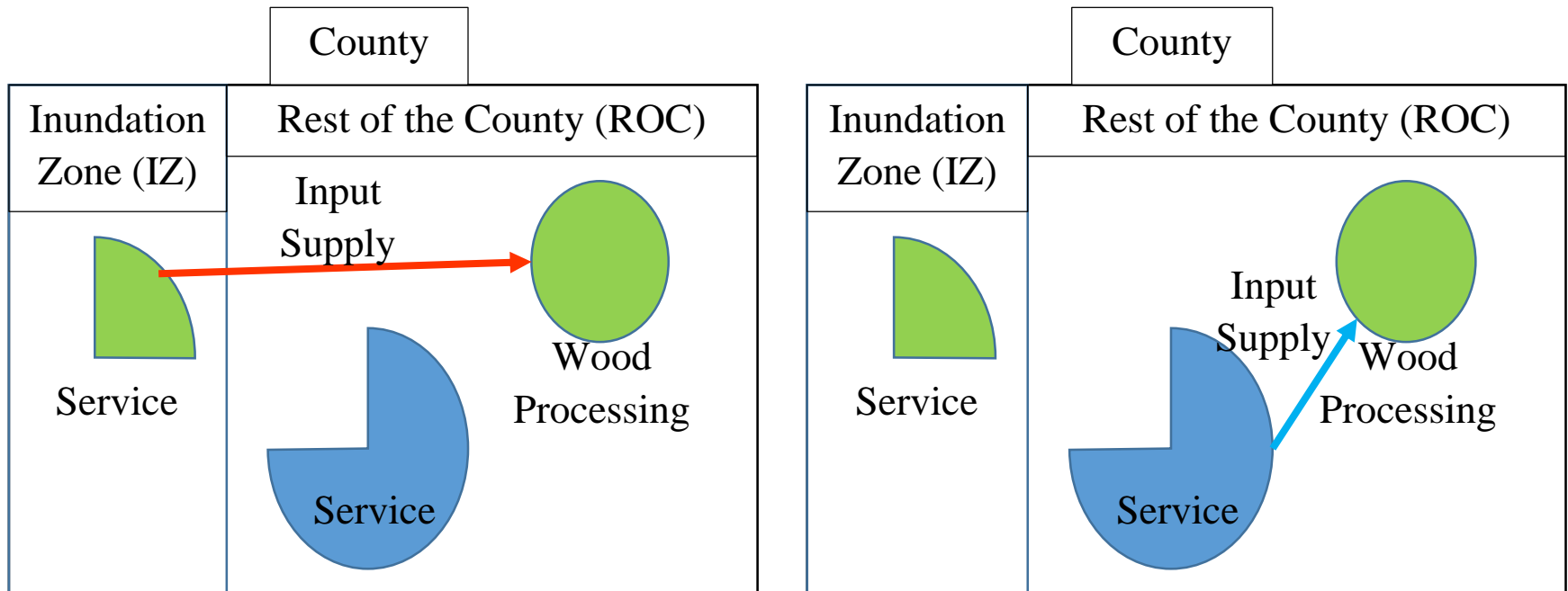


Illustration: Multi-regional CGE

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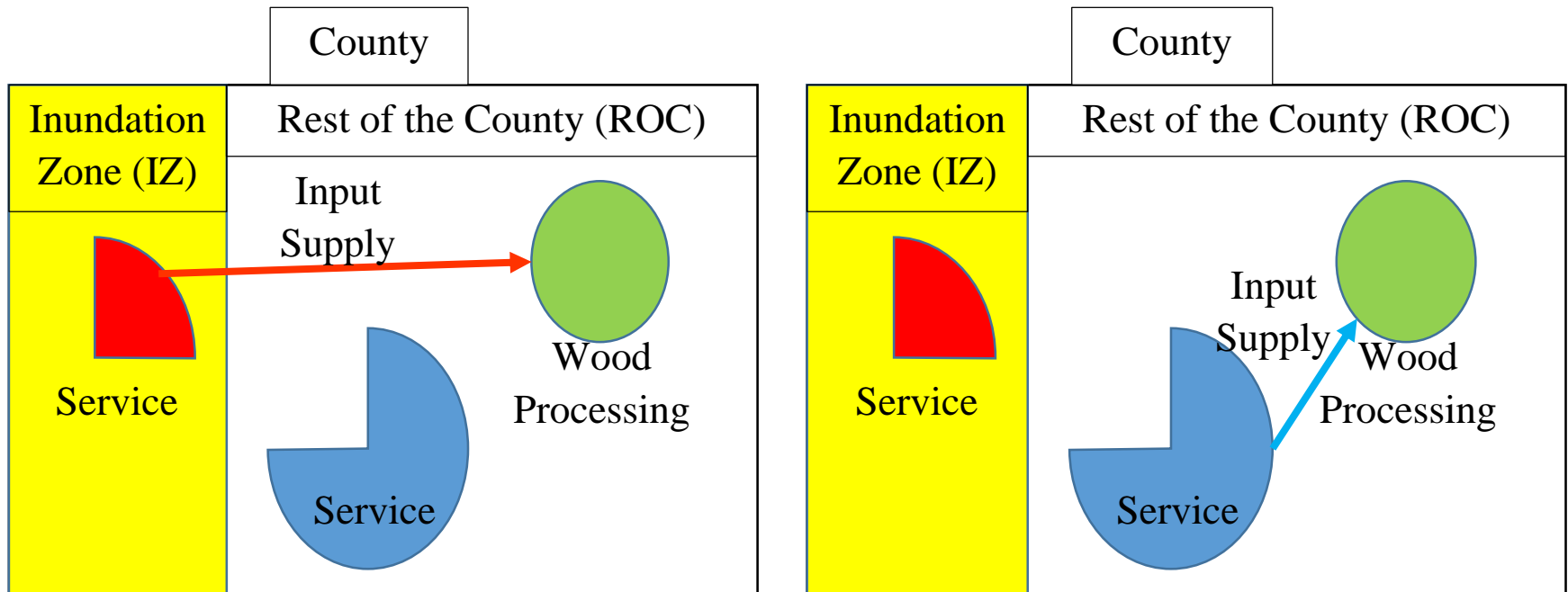
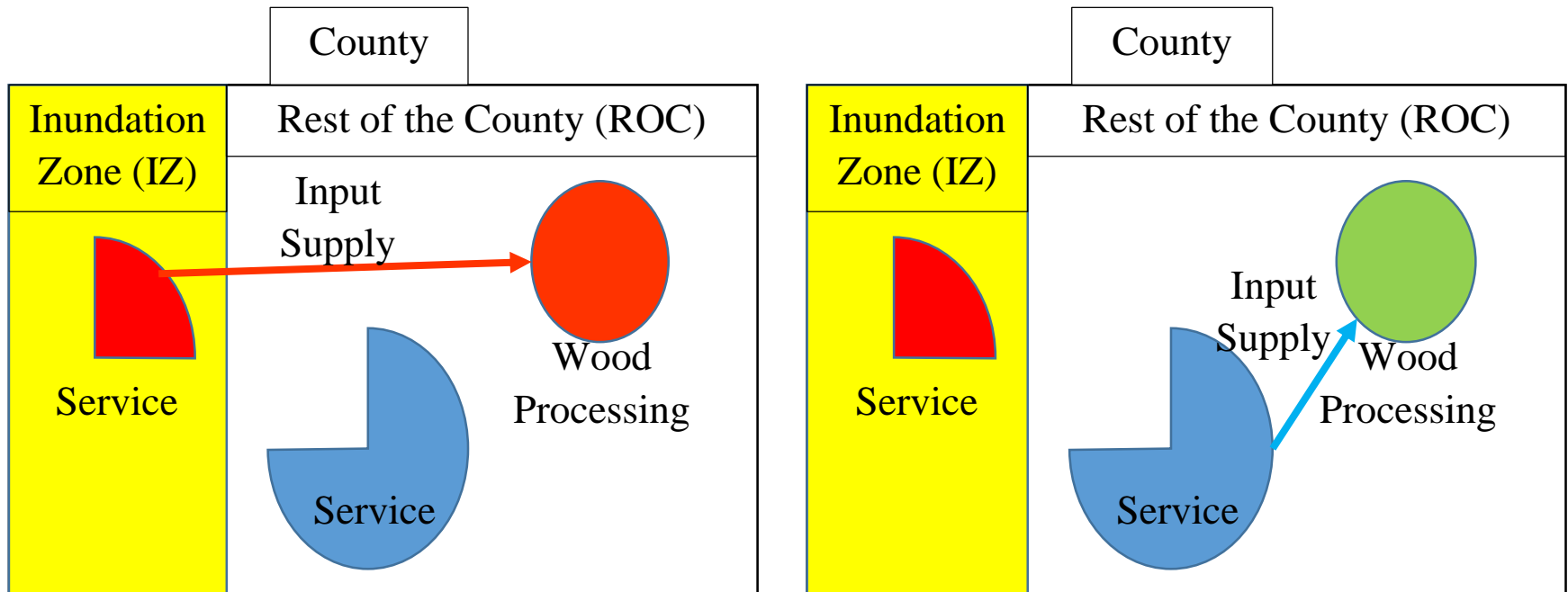
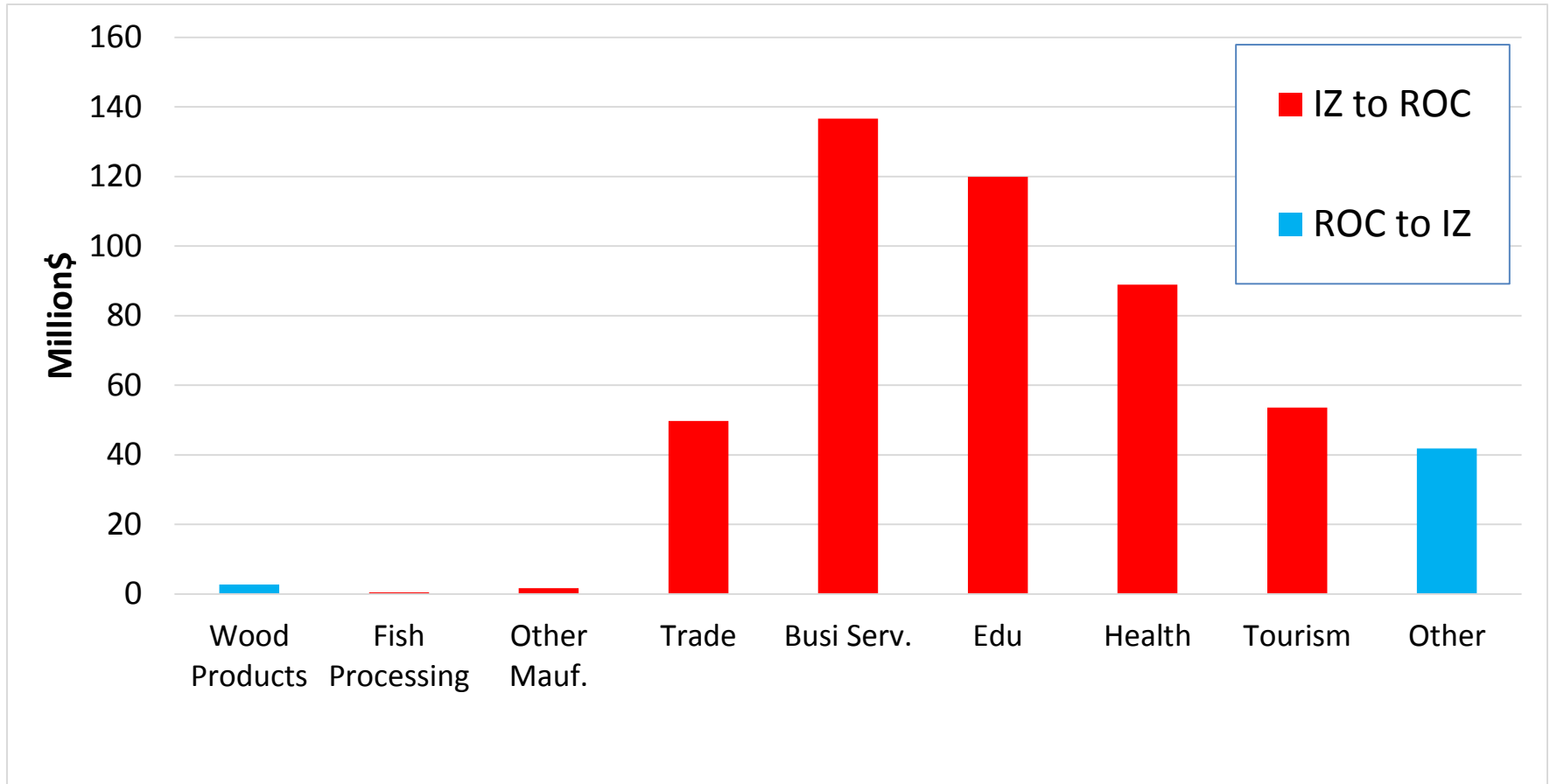


Illustration: Multi-regional CGE

- Spatial-Explicit economic transaction affect the estimation of indirect economic impacts



Economic Dependency on Industries Inside Inundation Zone



Summary and Extensions

- Spatially integrate engineer's estimation of Tsunami damages with Multi-Regional CGE framework
- The Multi-Regional CGE estimates greater indirect economic impacts
- Identify key sectors and economic transactions that affect economic vulnerability
- Support public projects to increase local economic resilience against natural disasters
- Apply the engineering-economic impact assessment model for cost and benefit analyses of other projects like transportation

Thank you!

Comments?

