

Appropriate Costing Options of Climate Change Adaptation in Infrastructure Development: Experimental Studies for Road and related Infrastructure Projects in Cambodia (CAMI)

Project Implementor: Master of Science in Climate Change Program, Graduate School of Science, Royal University of Phnom Penh (MCC/RUPP)

Project Partners: Asian Institute of Technology, Thailand; University of Freiburg, Germany (Foreign); Ministry of Public Work and Transport (MPWT), Ministry of Rural Development (MRD) (Local)

Project Locations: Kampong Thom and Pursat (Tonle Sap Lake), Kratie and Prey Veng (Mekong River), and Kampot (coastal zone)

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Background and objectives

Cambodia is one of the more disaster-prone countries in Southeast Asia, affected by floods and droughts on a seasonal basis. Weak adaptive capacity, poor infrastructure, and limited institutions exacerbate the country’s vulnerability to climate variability and change. Indeed, floods and droughts are recognized by the government as one of the main drivers of poverty. During the 20 years from 1987 to 2007, a succession of droughts and floods resulted in significant loss of life and considerable economic loss. In September 2013, heavy rainfall triggered severe flooding in the North- western and South-eastern regions of Cambodia, causing extensive damage across 20 of the country’s 24 provinces. Subsequently, it killed 188 people and almost 145,000 had been evacuated (UN, 2013). A flood event in October 2013 also resulted in damage to 440 km of national, provincial, and city roads and 64 drainage structure locations managed by the Ministry of Public Works and Transport. It affected 1,557 km of rural roads and 555 drainage structure locations managed by the Ministry of Rural Development. As a result, the flood event of October 2013 caused significant damage to all road types. The most affected provinces were determined to be: Battambang, Banteay Meanchey, Siem Reap, Kampong Cham, and Prey Veng (RGC, 2013). Therefore, the appropriate costing for climate adaptation of roads and related infrastructure projects needs to be comprehensively studied so that damages and losses caused by flood and other climate hazards can be properly incorporated from the economic and climate change standpoints.



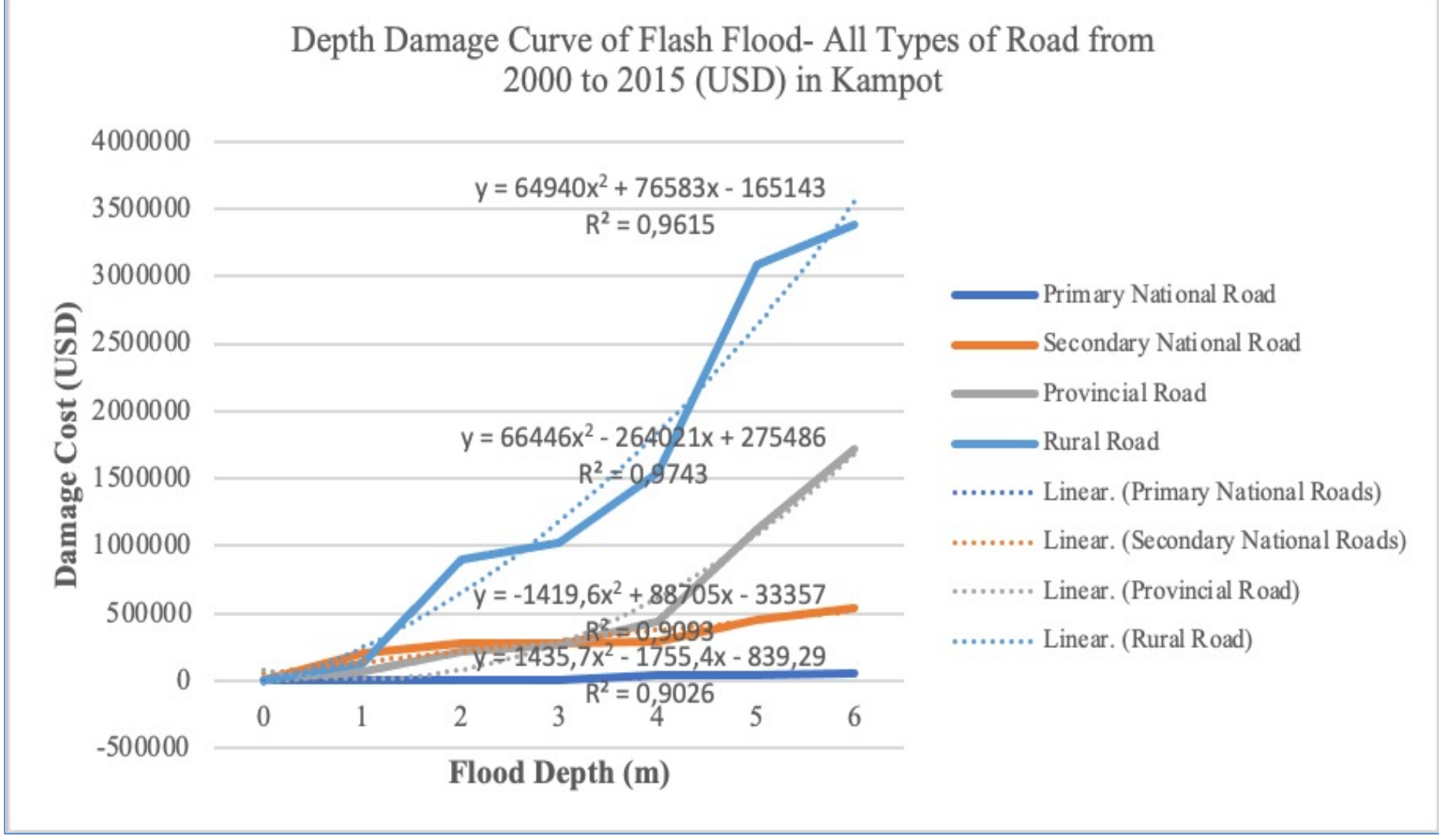
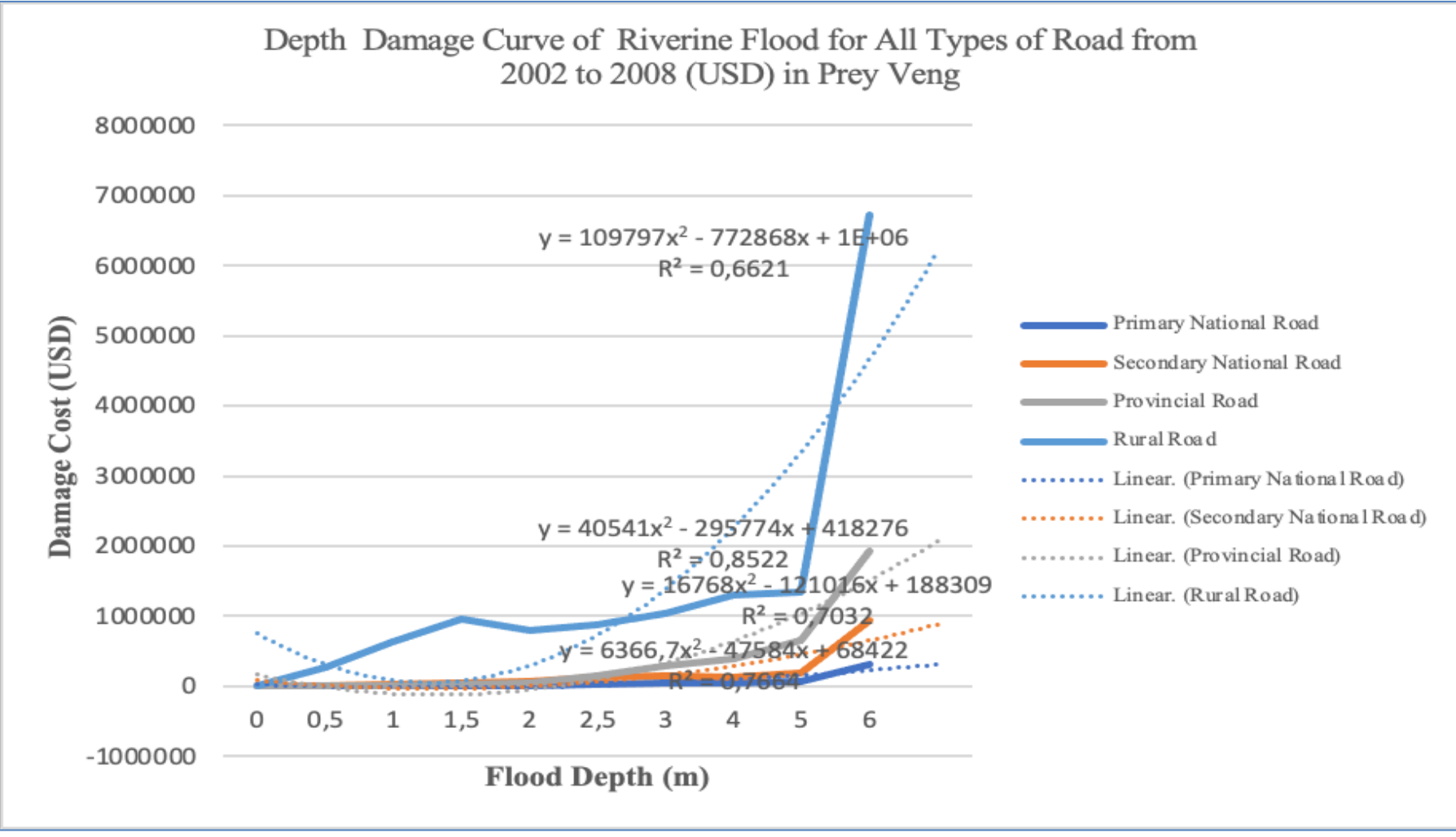
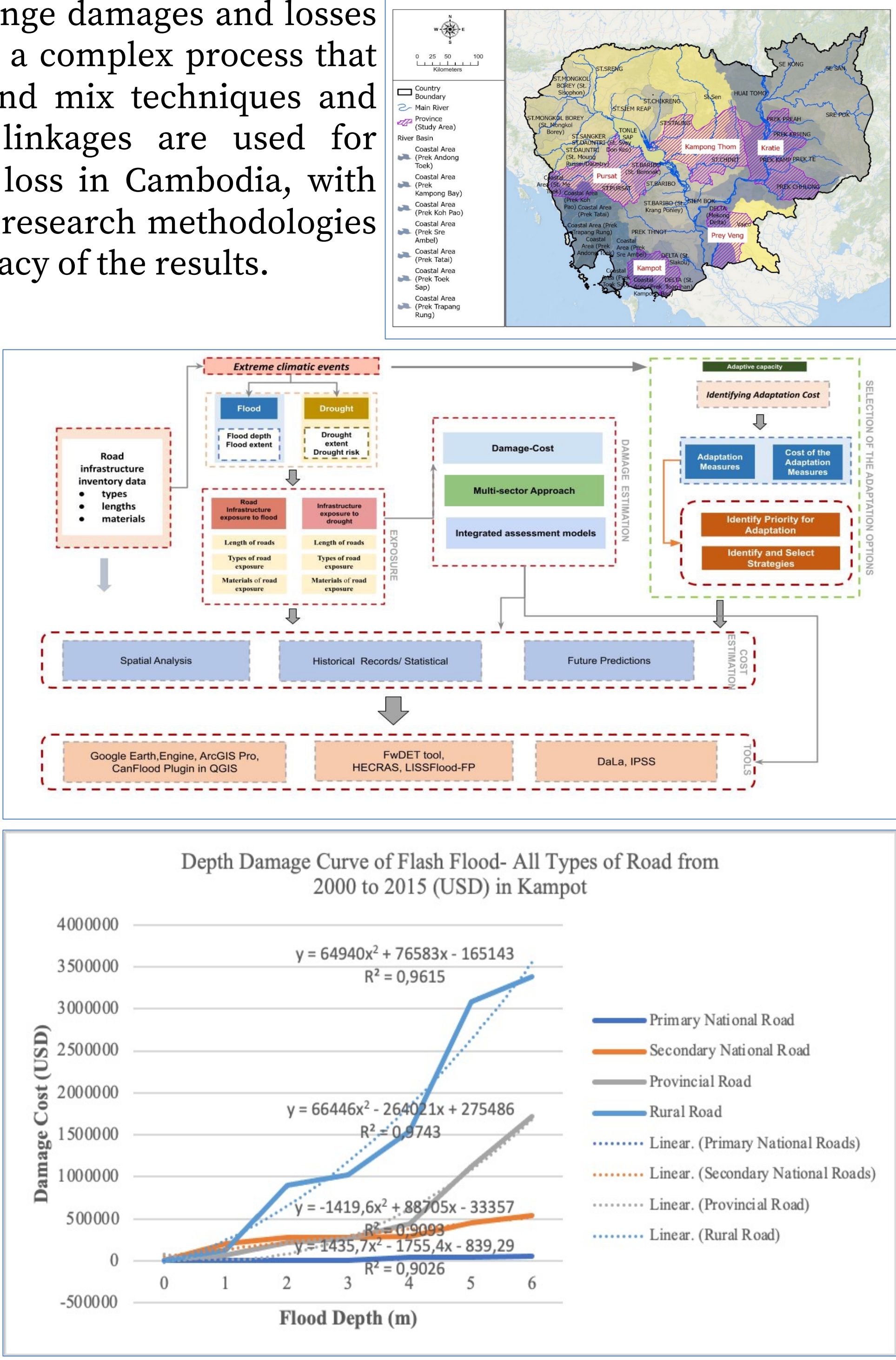
Overall, the evaluation of climate change damages and losses for roads and infrastructure requires the use of sophisticated tools and methods to ensure the reliability and robustness of the estimates. The **"Integrated Assessment Models (IAM)"** framework in Cambodia utilizes a combination of spatial and statistical analysis, as well as various tools, to provide a comprehensive evaluation of flood risks and their impact on roads and related infrastructure. Tools such as Flood Water Depth Estimation Tool (FwDET), ArcGIS, QGIS, Google Earth Engine, Open Street Map, simple Excel analysis, and Damage and Loss Assessment are used to identify damaged roads and calculate the cost of damages based on road types.

The project goal is to enhance the climate resilience capacity of roads and related development sectors in Cambodia.

Impact: contribute toward building climate resilient transport and small-scale irrigation infrastructures in Cambodia by adopting the cost effectiveness methods of adaptation, and improving the national climate resilient capacity in order to save the national budget and optimize the economic growth.

Key project outcome: analyses of damages and losses and adaptation costing due to impacts of climate change incorporated into development planning of roads and related infrastructure programs in Cambodia.

Results



No	Province	Road Name	Baseline Flood depth [m]	Flood SSP245 [m]	Flood SSP585 [m]	Change SSP245 [%]	Change SSP585 [%]
1	Pursat	RR287-T1	0.45	0.49	0.5	10%	12%
2		PR154	0.94	1.24	1.27	32%	35%
		PR152H					
		RR003-T1					
3	Kampong Thom	PR64C5	0.92	1.17	1.2	27%	30%
4	Kratie	RR016	0.55	0.67	0.68	22%	24%
5		NR73	0.22	0.23	0.24	8%	8%
6		RR005T1	4.41	5.59	5.74	27%	30%
7		PR382D	2.42	2.99	3.06	23%	26%
	Prey Veng	Second road (PR88)					
		PR70B					
8	Prey Veng	First road	2.19	2.75	2.81	25%	28%
9		NR43	0.02	0.03	0.04	27%	29%
10	Kampot	RR002	0.29	0.33	0.34	14%	16%
		RR001					

Result of inundation change in future 2031-2060 relative to baseline period under CMIP6 projection scenario

No	Province	Road Name	Flood SSP245 [m]	Flood SSP585 [m]	Change SSP245 [%]	Change SSP585 [%]
1	Pursat	RR287-T1	0.06	0.07	13%	15%
2		PR154	0.33	0.37	36%	40%
		PR152H				
		RR003-T1				
3	Kampong Thom	PR64C5	0.28	0.31	31%	34%
4	Kratie	RR016	0.13	0.15	26%	28%
5		NR73	0.03	0.03	11%	11%
6		RR005T1	1.33	1.48	31%	34%
7		PR382D	0.65	0.72	27%	30%
	Prey Veng	Second road (PR88)				
		PR70B				
8	Prey Veng	First road	0.62	0.69	29%	32%
9		NR43	0.01	0.01	33%	33%
10	Kampot	RR002	0.05	0.06	17%	20%
		RR001				

Result of inundation absolute change in future 2031-2060 relative to the baseline period under CMIP6 projection scenario

Approaches and technology used

The project approach will investigate the appropriate adaptation costing for infrastructure aspects through experimental studies on cost benefit analysis, and damages and losses.

- **Approaches to estimate Loss and Damage**

1. Historical data

2. Projected data

3. Aspects: Maintenance and performance of Development projects
- **Adaptation Strategies**

1. Design parameters

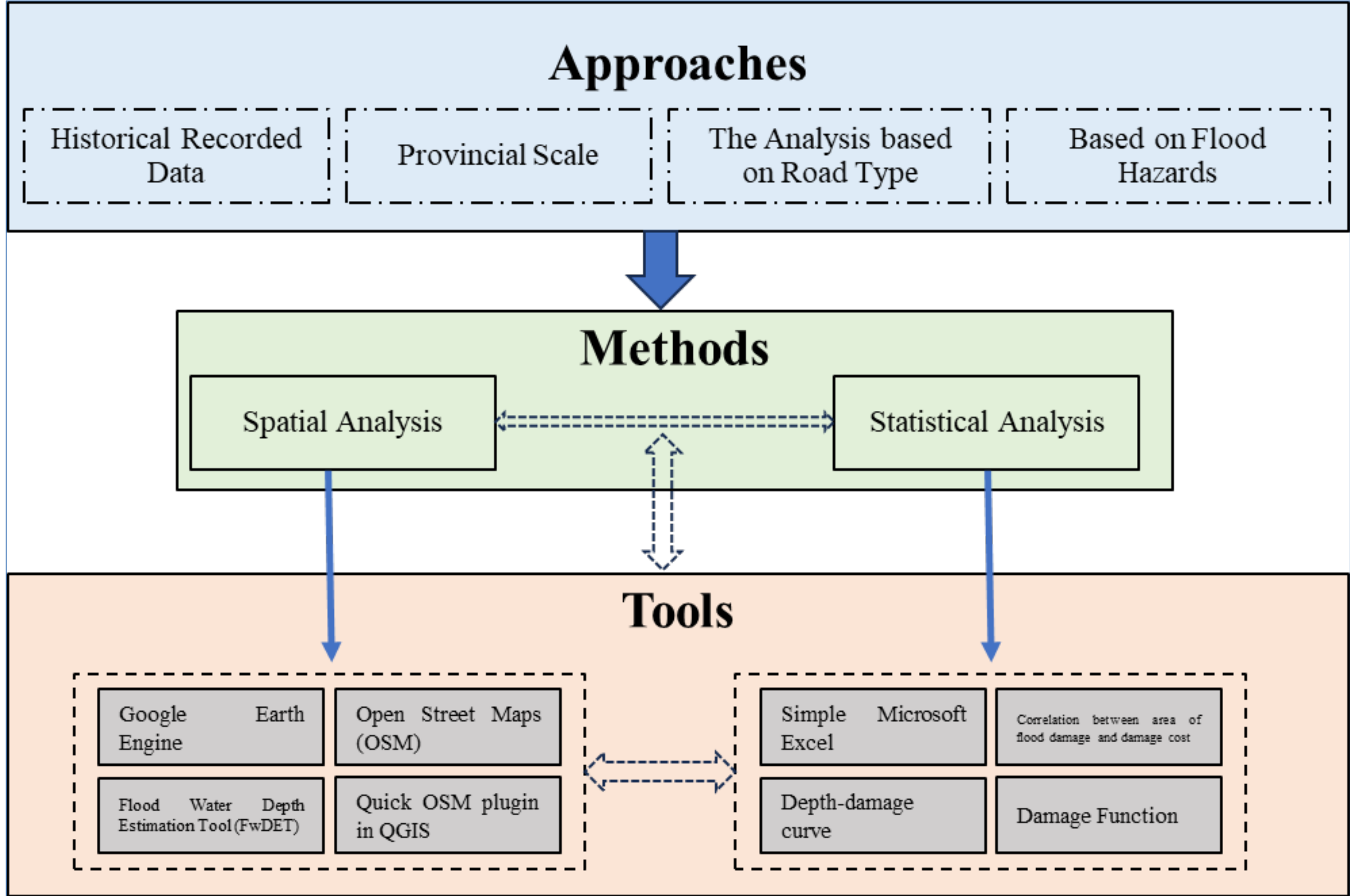
2. Choice of materials

3. Maintenance

4. Life-cycle costing
- **Cost Benefit Analysis**

1. Adaptation Strategies with climate change scenario

2. Adaptation Strategies without climate change scenario



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