

Supplementary materials—Future changes in built environment risk to coastal flooding, permanent inundation, and coastal erosion hazards



Figure S1. Photograph of a coastal landslide in Omokoroa within Tauranga Harbour. The landslide resulted in more than 1ha of land lost. Material at the toe is now becoming vegetated but will continue to be eroded and removed until the erosion of the cliff toe resumes.



Figure S2. Flooding of low-lying coastal land during the high storm-tide on 5 February 2018. The sea-level reached on this date has about a 3% chance of occurring in any year at present-day MSL (Stephens 2017).



Figure S3. c, 10:30, 30th April 2017. Photo credit: Kate Enright.



Figure S4. High tide at the Bay St Reserve which borders the Matua Estuary on 17 November 2016. Photo credit: Jim McMaster.

Table S1. Land area flooded to a depth ≥ 0.3 m (km²). Gaps in the table represent unmodelled scenarios. 20% AEP coastal flooding results are assumed identical to 1% AEP coastal flooding but with delayed onset of +0.14 m RSLR.

RSLR (m)	1% AEP coastal flooding			Permanent inundation			Coastal erosion	
	Dynamic model	Static-inclined model	Static-planar model	Dynamic model	Static-inclined model	Static-planar model	E_{medium}	E_{high}
0.1	25	26	19	3	3	2	3	5
0.2	27	27	22		3	3		
0.3	29	30			4			
0.4	32	33	29	5	6	4		
0.5	34	36			8		5	
0.6	36	39	35	9	10	7		
0.7	39	41			12		6	8
0.8	42	44	40	13	15	12		
0.9	45	47			17		7	
1	47	49			20			
1.25	52	54	51	26	28	27	8	11

	1% AEP coastal flooding			Permanent inundation			Coastal erosion	
1.6	59	61	57	37	39	38	11	

Table S2. Total number of buildings exposed. Gaps in the table represent unmodelled scenarios. 20% AEP coastal flooding results are assumed identical to 1% AEP coastal flooding but with delayed onset of +0.14 m RSLR.

	1% AEP coastal flooding			Permanent inundation			Coastal erosion	
RSLR (m)	Dynamic model	Static-inclined model	Static-planar model	Dynamic model	Static-inclined model	Static-planar model	E_{medium}	E_{high}
0.1	227	379	100	3	3	1	76	297
0.2	334	510	142		6	3		
0.3	454	664			8			
0.4	589	844	404	9	9	6		
0.5	782	1064			14		222	
0.6	1035	1276	710	19	23	12		
0.7	1323	1511			52		256	475
0.8	1560	1720	1108	88	105	38		
0.9	1831	1964			175		403	
1	2097	2160			242			
1.25	2619	2683	2135	430	471	331	480	739
1.6	3217	3269	2855	976	1117	913		817

Table S3. Total building replacement value (millions NZD\$ (2016)). Gaps in the table represent unmodelled scenarios. 20% AEP coastal flooding results are assumed identical to 1% AEP coastal flooding but with delayed onset of +0.14 m RSLR.

	1% AEP coastal flooding			Permanent inundation			Coastal erosion	
RSLR (m)	Dynamic model	Static-inclined model	Static-planar model	Dynamic model	Static-inclined model	Static-planar model	E_{medium}	E_{high}
0.1	104	163	48	3	2	0	18	93
0.2	138	211	62		3	1		
0.3	174	260			6			
0.4	229	324	181	7	6	5		
0.5	333	438			8		65	
0.6	416	497	340	10	10	8		
0.7	541	590			20		79	148
0.8	619	649	504	39	47	18		
0.9	725	766			77		130	
1	805	843			106			
1.25	963	1026	884	187	221	137	155	229
1.6	1273	1233	1132	442	530	422		248

Table S4. Median depth of flooding of buildings (metres). Gaps in the table represent unmodelled scenarios. 20% AEP coastal flooding results are assumed identical to 1% AEP coastal flooding but with delayed onset of +0.14 m RSLR.

RSLR (m)	1% AEP coastal flooding			Permanent inundation		
	Dynamic model	Static-inclined model	Static-planar model	Dynamic model	Static-inclined model	Static-planar model
0.1	0.51	0.52	0.43	0.39	0.36	0.30
0.2	0.50	0.54	0.48		0.34	0.33
0.3	0.51	0.54			0.42	
0.4	0.55	0.56	0.56	0.49	0.50	0.53
0.5	0.58	0.58			0.51	
0.6	0.59	0.61	0.56		0.40	0.59
0.7	0.64	0.65		0.45	0.36	
0.8	0.70	0.69			0.37	0.40
0.9	0.74	0.73	0.62	0.40	0.40	
1	0.81	0.79			0.44	
1.25	0.98	0.93	0.82	0.53	0.53	0.54
1.6	1.21	1.15	1.01	0.59	0.56	0.57

Table S5. Estimate of land area affected from coastal erosion by different timeframe, sea level rise and probability levels. Based on scaling the length of shoreline for which coastal erosion assessments were undertaken versus total length of shoreline (Tonkin & Taylor 2019)

Scenario	Total area affected (km ²)	Scaled up land area affected (km ²)
Current E_{medium}	1.1	3.3
Current E_{high}	1.7	5.1
2080 0.4m SLR E_{medium}	1.8	5.3
2080 0.6m SLR E_{medium}	1.9	5.6
2080 0.6m SLR E_{high}	2.6	7.8
2130 0.8m SLR E_{medium}	2.4	7.2
2130 1.25m SLR E_{medium}	2.6	7.8
2130 1.25m SLR E_{high}	3.6	10.7
2130 1.6m SLR E_{high}	3.8	11.3