

Supplementary Material: Background of the Case Studies

The background of the Kent Ridge and the Waas Case study is presented herewith to enable the reader to better understand the main paper.

1. Climate Scenarios, Kent Ridge Case Study

Table S1. Climate Scenarios. Kent Ridge Case Study. Adapted from (Manocha and Babovic, 2017)

Baseline	Extrapolation of historical trend
W1 (Wet 1)	10% wetter climate (2016-2100), compared to baseline
W2 (Wet 2)	25% wetter climate (2016-2100), compared to baseline
D1 (Dry 1)	10% dryer climate (2016-2100), compared to baseline

2. Land Use Scenarios, Kent Ridge Case Study

Table S2. Landuse Scenarios. Kent Ridge Case Study. Adapted from (Manocha and Babovic, 2017)

Land use type	% of land use in Current Scenario	% of land use in Green Scenario	% of land use in Sustainable Grey Scenario
Impervious	10	5	15
Grass on steep slope	10	10	10
Grass on mild slope	18	13	18
Mixed grass and trees	15	15	10
Natural Vegetation	30	40	12
Roofs	17	17	35

3. Adaptation Tipping Points, Kent Ridge Case Study

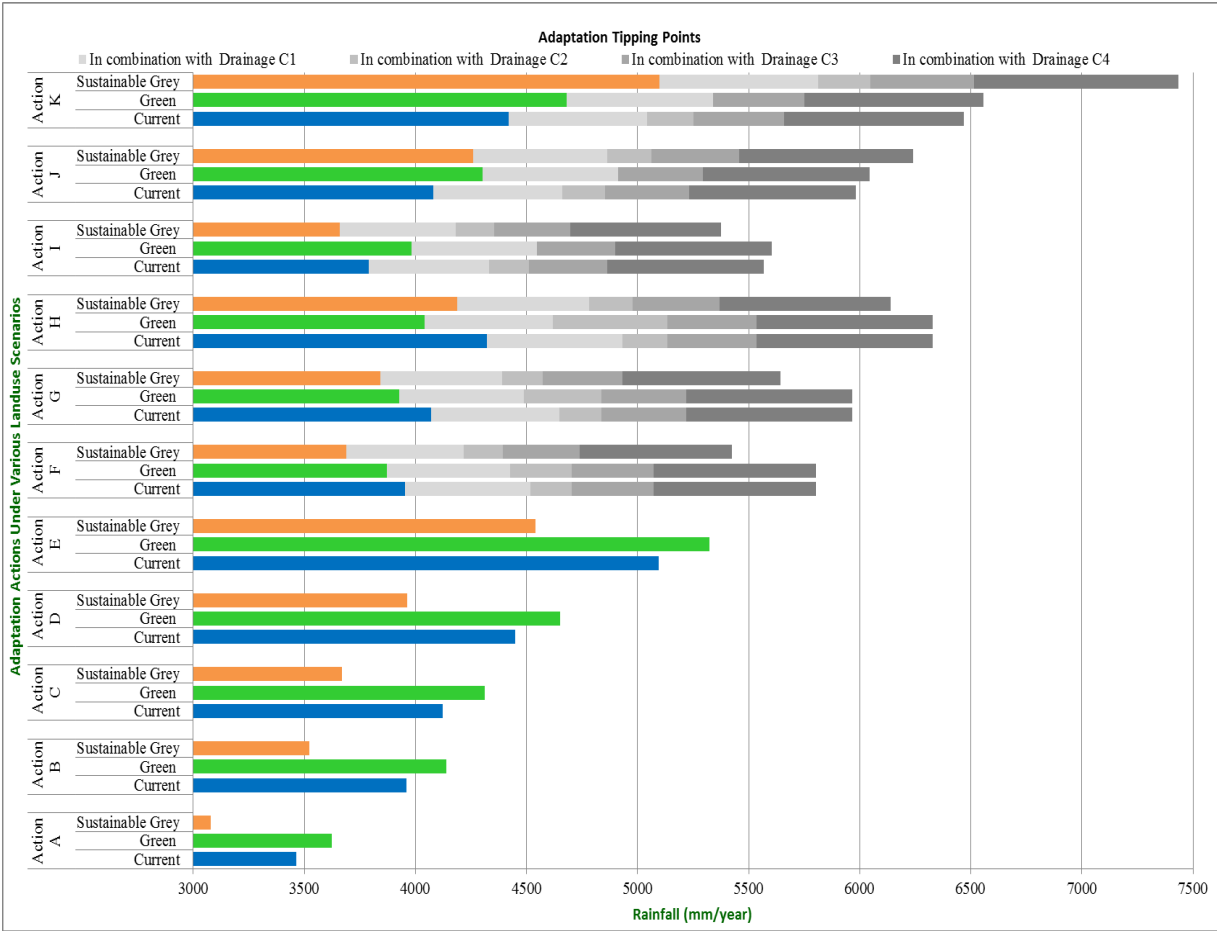


Figure S1. Adaptation Tipping Points of Adaptation Actions. Please refer to Table 1 in the main paper for the key of action portfolios. Adapted from (Manocha and Babovic, 2017)

4. Adaptation Tipping Points, Waas Case Study.

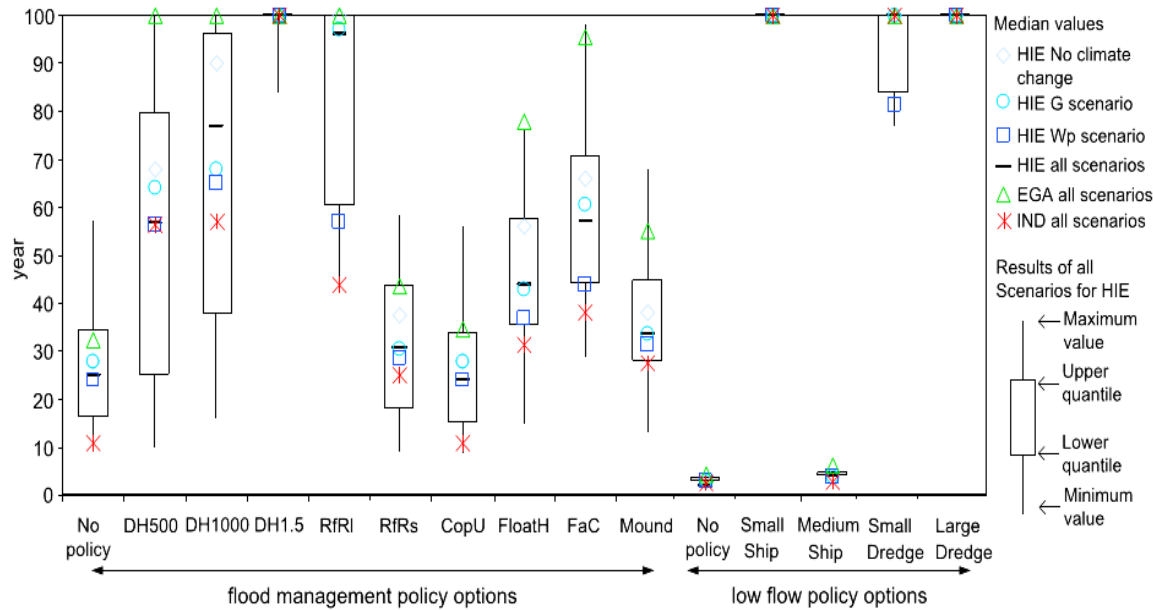


Figure S2. Adaptation Tipping Points for the Waas Case. Adapted from (Middelkoop et al., 2012)

5. Results

The results for the two sequencing approaches (Build Up and Build to Target) for the two selection criterion (Net Present Valuation and Real Options Analysis) for both case studies are presented. The sequencing was performed individually for each selection criterion, the Net Present Value (NPV) and the Real Options Value. The tables also indicate the associated value of the other selection criterion to facilitate comparison.

5.1. Kent Ridge Catchment

Table S3. Results BTT sequencing approach using ROA as selection criterion, Kent Ridge Catchment.

Assessment Scenario	Pathway	Selection Criterion: Real Options Value (1000 SGD)	NPV (1000 SGD)
Climate : B, Landuse: B	AC	72.81	-31.72
Climate : W1, Landuse: B	ACE	136.96	-9.14
Climate : W2, Landuse: B	ACE	240.03	908.20
Climate : D1, Landuse: B	AC	-11.29	-42.93
Climate : All, Landuse: B	AD	160.21	11.88
Climate : B, Landuse: G	AB	42.93	-38.42
Climate : W1, Landuse: G	AD	112.60	-19.28
Climate : W2, Landuse: G	ABE	228.69	26.69
Climate : D1, Landuse: G	AK	-40.08	-73.17
Climate : All, Landuse: G	AD	106.06	-9.21
Climate : B, Landuse: SG	ACE	151.89	0.81
Climate : W1, Landuse: SG	ACE	224.64	78.45
Climate : W2, Landuse: SG	AEI	458.77	303.65
Climate : D1, Landuse: SG	AC	210.81	-26.88
Climate : All, Landuse: SG	ADE	299.49	127.83

Table S4. Results BU sequencing approach using ROA as selection criterion, Kent Ridge Catchment.

Assessment Scenario	Pathway	Selection Criterion: Real Options Value (1000 SGD)	NPV (1000 SGD)
Climate : B, Landuse: B	AC	72.81	-31.72
Climate : W1, Landuse: B	ACE	136.96	-9.14
Climate : W2, Landuse: B	ACE	240.03	90.82
Climate : D1, Landuse: B	AC	-11.29	-42.93
Climate : All, Landuse: B	ACE	109.63	1.76
Climate : B, Landuse: G	AD	42.64	-39.68
Climate : W1, Landuse: G	AD	112.60	-19.28
Climate : W2, Landuse: G	ACE	226.61	41.14
Climate : D1, Landuse: G	AG	29.01	-412.21
Climate : All, Landuse: G	AD	106.06	-9.21
Climate : B, Landuse: SG	AE	120.38	8.58
Climate : W1, Landuse: SG	AE	136.08	118.67
Climate : W2, Landuse: SG	AEI	458.77	303.65
Climate : D1, Landuse: SG	AE	74.91	-33.61
Climate : All, Landuse: SG	ADE	299.49	127.83

Table S5. Results BTT sequencing approach using NPV as selection criterion, Kent Ridge Catchment.

Assessment Scenario	Pathway	Selection Criterion: NPV (1000 SGD)	Real Options Value (1000 SGD)
Climate : B, Landuse: B	AC	-31.72	72.81
Climate : W1, Landuse: B	AE	-5.28	11.76
Climate : W2, Landuse: B	AE	135.46	135.46
Climate : D1, Landuse: B	AC	-42.93	-11.29
Climate : All, Landuse: B	AE	12.53	77.53
Climate : B, Landuse: G	AB	-38.42	42.93
Climate : W1, Landuse: G	AD	-19.28	112.60
Climate : W2, Landuse: G	AE	66.00	152.49
Climate : D1, Landuse: G	AB	-43.60	-40.20
Climate : All, Landuse: G	AD	-9.21	106.06
Climate : B, Landuse: SG	AE	8.58	120.38
Climate : W1, Landuse: SG	AE	118.67	136.08
Climate : W2, Landuse: SG	AEI	303.65	458.77
Climate : D1, Landuse: SG	AC	-26.68	210.81
Climate : All, Landuse: SG	AE	127.83	299.49

Table S6. Results BU sequencing approach using NPV as selection criterion, Kent Ridge Catchment.

Assessment Scenario	Pathway	Selection Criterion: NPV (1000 SGD)	Real Options Value (1000 SGD)
Climate : B, Landuse: B	AE	-36.01	69.12
Climate : W1, Landuse: B	AE	-5.28	117.66
Climate : W2, Landuse: B	AE	135.46	135.46
Climate : D1, Landuse: B	AC	-42.93	-11.29
Climate : All, Landuse: B	AE	12.53	77.53
Climate : B, Landuse: G	AD	-39.68	42.64
Climate : W1, Landuse: G	AD	-19.28	112.60
Climate : W2, Landuse: G	ADE	59.69	208.45
Climate : D1, Landuse: G	AD	-43.87	-40.21
Climate : All, Landuse: G	AD	-9.21	106.06
Climate : B, Landuse: SG	AE	8.58	120.38
Climate : W1, Landuse: SG	AE	118.67	136.08
Climate : W2, Landuse: SG	AEI	303.65	458.77
Climate : D1, Landuse: SG	AE	-33.61	74.91
Climate : All, Landuse: SG	AE	127.83	299.49

5.2. Results: Waas Case

Table S7. Results BTT sequencing approach using ROA as selection criterion, Waas Case.

Assessment Scenario	Pathway	Selection Criterion: Real Options Value (M Euros)	NPV (M Euros)
NoCC	EABC	4770.44	415.31
G	ABC	6346.72	891.06
Wp	EABC	10642.46	1404.81
All HIE Scenario	EABD	8403.88	1010.27

Table S8. Results BU sequencing approach using ROA as selection criterion, Waas Case.

Assessment Scenario	Pathway	Selection Criterion: Real Options Value (M Euros)	NPV (M Euros)
NoCC	C	2605.94	759.20
G	C	3565.75	1039.26
Wp	C	5643.93	2039.15
All HIE scenario	C	3942.84	1349.81

Table S9. Results BTT sequencing approach using NPV as selection criterion, Waas Case.

Assessment Scenario	Pathway	Selection Criterion: NPV (M Euros)	Real Options Value (M Euros)
NoCC	C	759.20	2605.94
G	C	1039.26	3565.75
Wp	C	2039.15	5643.93
All HIE scenario	C	1349.81	3942.84

Table S10. Results BU sequencing approach using NPV as selection criterion, Waas Case

Assessment Scenario	Pathway	Selection Criterion: NPV (M Euros)	Real Options Value (M Euros)
NoCC	C	759.20	2605.94
G	C	1039.26	3565.75
Wp	C	2039.15	5643.93
All HIE Scenario	C	1349.81	3942.84