

CONTENTS

Preface	v
1. What is Beach Erosion?	1
2. Beach Erosion — Current Reality	7
2.1. Classification of Causes of Beach Erosion	7
2.2. Beach Erosion Due to Obstruction of Longshore Sand Transport	13
2.2.1. Shibetsu Coast in Eastern Hokkaido	14
2.2.2. Monbetsu Coast in Hidaka in Hokkaido	19
2.2.3. Misawa Fishing Port in Aomori Prefecture	23
2.2.4. Momosaki-hama Coast in Niigata Prefecture	27
2.2.5. Shinkawa Fishing Port in Niigata Prefecture	39
2.2.6. Fuji Coast in Shizuoka Prefecture	54
2.2.7. Fukude Fishing Port in Shizuoka Prefecture	61
2.2.8. Imazu-sakano Coast in Tokushima Prefecture	64
2.2.9. Method of Addressing Issues	68
2.3. Beach Erosion Triggered by Construction of Wave-Sheltering Structures	73
2.3.1. Teradomari and Nozumi Coasts in Niigata Prefecture	73
2.3.2. Kashiwazaki Port and Arahama Coast in Niigata Prefecture	81
2.3.3. Ohtsu Fishing Port in Ibaraki Prefecture	93
2.3.4. Ajigaura Beach and Naka Coast in Ibaraki Prefecture	100
2.3.5. Kemigawa Beach in Chiba Prefecture	109

2.3.6.	Tojo–Maebara Coast in Kamogawa City in Chiba Prefecture	117
2.3.7.	Shimobara Fishing Port in Tateyama City in Chiba Prefecture	121
2.3.8.	Asamogawa Coast in Kyoto Prefecture	130
2.3.9.	Tsutsuki Beach on Iki Island in Nagasaki Prefecture	133
2.3.10.	Shiratsuru Beach in Amakusa District in Kumamoto Prefecture	140
2.3.11.	Kashiwabara Coast in Kagoshima Prefecture	151
2.3.12.	Methods of Addressing Issues	155
2.4.	Beach Erosion Due to Decrease in Fluvial Sediment Supply	162
2.4.1.	Shizuoka and Shimizu Coasts in Shizuoka Prefecture	162
2.4.2.	Suruga Coast in Shizuoka Prefecture	184
2.4.3.	Tenryu River and Enshu-nada Coast in Shizuoka Prefecture	191
2.4.4.	Methods of Addressing Issues	195
2.5.	Beach Erosion Triggered by Offshore Sand Mining/Dredging	198
2.5.1.	Mouth of Sagami River in Kanagawa Prefecture	198
2.5.2.	Off Mouth of Niyodo River in Kochi Prefecture	200
2.5.3.	Off Sumiyoshi-hama Sand Spit in Oita Prefecture	208
2.5.4.	Methods of Addressing Issues	213
2.6.	Beach Erosion Triggered by Construction of Detached Breakwater as Countermeasure	215
2.6.1.	Ariake–Takahama Coast in Ibaraki Prefecture	216
2.6.2.	Ghotsu Coast in Shimane Prefecture	230
2.6.3.	Methods of Addressing Issues	234

2.7.	Disappearance of Natural Sand Dunes Due to Excess	
	Planting of Coastal Forest	236
2.7.1.	Nakamura-hama Coast in Niigata Prefecture . .	236
2.7.2.	Node Coast in Chiba Prefecture	249
2.7.3.	Southern Kujukuri Coast in Chiba Prefecture . .	262
2.7.4.	Heisa-ura Coast in Chiba Prefecture	269
2.7.5.	Methods of Addressing Issues	278
2.8.	Disappearance of Sandy Beach Triggered by	
	Construction of Gently Sloping Revetment	283
2.8.1.	Isewan-seinan Coast in Mie Prefecture	284
2.8.2.	Kitanowaki Coast in Tokushima Prefecture . . .	291
2.8.3.	Uchihama Coast on Miyako Island in Okinawa .	296
2.8.4.	Methods of Addressing Issues	301
3.	Practical Models for Predicting Beach Changes	309
3.1.	Characteristics of Practical Models	309
3.2.	Prediction of Stable Shoreline on Pocket Beach	311
3.2.1.	Predictive Model	311
3.2.2.	Example	312
3.3.	Three-Dimensional Model for Predicting Beach Changes	
	Using Hsu and Evans' Model	315
3.3.1.	Predictive Model	315
3.3.2.	Numerical Calculation Procedure	317
3.3.3.	Example	318
3.4.	Predictive Model of Three-Dimensional Beach Changes	
	on Coast With a Seawall by Expanding Hsu and Evans'	
	Model	327
3.4.1.	Predictive Model	327
3.4.2.	Example	329
3.5.	Simple Model for Predicting Three-Dimensional Beach	
	Changes on Statically Stable Beach	331
3.5.1.	Predictive Model	331
3.5.2.	Example	336

3.6.	Shoreline Change Model on Coasts Composed of Sand of Mixed Grain Size	342
3.6.1.	Predictive Model	342
3.6.2.	Example	347
3.7.	Predictive Model of Shoreline and Grain Size Around River Mouth	352
3.7.1.	Predictive Model	352
3.7.2.	Example	354
3.8.	Contour-Line Change Model Considering Stabilization Mechanism of Longitudinal Profile	363
3.8.1.	Calculation Method	363
3.8.2.	Comparison of Results of Experiments and Numerical Simulations	375
3.9.	Contour-Line Change Model Solved on x - y Meshes	386
3.9.1.	Predictive Model	386
3.9.2.	Examples	393
4.	Beach Erosion as Structural Problem	405
4.1.	Introduction	405
4.2.	Institutional (legal) Issues Related to Beach Erosion	406
4.2.1.	Occurrence of Issues at Boundaries Between Shore Protection, Port, and Fishing Port Areas	406
4.2.2.	Relationship Between Dredging Operations and Beach Erosion	408
4.2.3.	Issues Arising from Conceptual Differences in Land Management by Coastal Act and Forest Law	409
4.2.4.	Issues Related to Method by Which Public Sectors Expend Their Budgets	410
4.2.5.	Work of Restoring Damaged Coast	411
4.2.6.	System of Administration and Difficulty of Training of Specialists	412
4.3.	Technical Issues Related to Beach Erosion	412
4.4.	Concrete Measures	413
	Index	417