

Overview of Chapters

Table of Abbreviations	27
Introduction	35
Part One: Self-Spreading Biotechnology Challenges International Law	45
Chapter 1: The Emergence of Self-Spreading Biotechnology	47
Chapter 2: Concepts and Terms Relevant to Transboundary Harm Caused by Biotechnology	107
Part Two: Prevention of Transboundary Harm	129
Chapter 3: The Regulation of Biotechnology in International Law	131
Chapter 4: Prevention of Transboundary Harm from Biotechnology Under Customary International Law	247
Chapter 5: The International Governance of Engineered Gene Drives	317
Part Three: Operator Liability	365
Chapter 6: The Nagoya – Kuala Lumpur Supplementary Protocol on Redress and Liability	367
Chapter 7: A Private Liability Scheme: The ‘Biodiversity Compact’	461

Chapter 8: A Customary Obligation to Ensure Prompt and Adequate Compensation for Transboundary Damage?	477
Part Four: Responsibility and Liability of States	493
Chapter 9: State Responsibility for Transboundary Harm Caused by Biotechnology	495
Chapter 10: Strict State Liability for Transboundary Harm?	595
Chapter 11: Compensation for Environmental Damage in International Law	617
Concluding Remarks	665
Summary of Results	671
Zusammenfassung in deutscher Sprache	689
Table of Cases	713
Table of Treaties and Instruments	721
Bibliography	743

Table of Contents

Table of Abbreviations	27
Introduction	35
Part One: Self-Spreading Biotechnology Challenges International Law	45
Chapter 1: The Emergence of Self-Spreading Biotechnology	47
A. Principles of Genetics and Molecular Biology	48
I. Basics of Molecular Biology	48
II. Natural Genetic Change and Inheritance	51
1. Genetic Mutation	51
2. Sexual Reproduction	53
3. Mendel's Laws of Inheritance	54
III. Anthropogenic Genetic Change	54
B. Genome Editing	56
I. Functioning of Genome Editing	57
II. Engineered Nuclease Techniques for Site-Specific DNA Cleavage	59
1. Zinc Finger Nucleases	59
2. Transcription Activator-Like Effector Nucleases	60
3. CRISPR-Cas	61
III. Applications of Genome Editing Techniques	65
1. Agriculture	65
2. Basic Research and Medicine	67
3. Human Germline Editing	69
4. Industrial Biotechnology	70
IV. Technical Challenges of CRISPR-Cas Based Genome Editing	70
1. Off-Target Effects	70
2. Genetic Mosaicism	72
3. In Vivo Delivery of CRISPR-Cas Components	72

V. Environmental Risks and Ethical Concerns Connected to the Use of Genome Editing	73
1. Alleged Environmental Risks of Genome Editing in Agriculture	73
2. Risks and Ethical Concerns Relating to Human Genome Editing	75
C. Engineered Gene Drives	77
I. Natural Gene Drive Mechanisms	78
1. Over-Replication Mechanisms	78
2. Interference Mechanisms	79
II. Development of Engineered Gene Drives	81
III. Potential Applications of Engineered Gene Drives	83
1. Control of Vector-Borne Diseases	84
a) Modification Drives	84
b) Suppression Drives	85
c) Current State of Development	86
2. Control of Invasive Species	88
3. Agriculture	89
IV. Limitations and Risks of Applying Engineered Gene Drives	89
1. Limitations of Current Gene Drive Techniques	90
2. Risks Related to Gene Drive Applications	91
a) Unintended Geographic Spread	92
b) Intended but Unauthorized Spread	92
c) Undesired Spread to Non-Target Species	93
d) Dual Use of Gene Drive Techniques	94
3. Potential Ecological Effects of Suppressing a Target Species	94
4. Potential Transboundary Effects of Gene Drives	96
D. Horizontal Environmental Genetic Alteration Agents (HEGAAs)	97
E. Self-Spreading Biotechnology Not Involving Genetic Alteration of the Target Organism	99
I. Use of Genetically Modified Viruses in Plant Pest Control	100
II. Self-Disseminating Vaccines	101
III. Mass Releases of Sterile Genetically Modified Insects	103
IV. Use of Wolbachia to Suppress Mosquito-Vectored Infectious Diseases	104
F. Summary	105

Chapter 2: Concepts and Terms Relevant to Transboundary Harm Caused by Biotechnology	107
A. ‘Genetically Modified’ and ‘Living Modified’ Organisms	108
B. Types of Damage Potentially Caused by LMOs	109
C. The Distinction Between ‘Responsibility’ and ‘Liability’	112
D. The ‘Polluter-Pays’ Principle: State or Operator Liability?	114
E. Standards of Liability: Fault-Based, Objective, Strict, and Absolute Liability	116
F. Procedural Issues in Enforcing Civil Liability in a Transboundary Context	119
G. Civil Liability and ‘Administrative Liability’ for Damage to the Environment	123
H. Summary and Outlook	126
Part Two: Prevention of Transboundary Harm	129
Chapter 3: The Regulation of Biotechnology in International Law	131
A. The Cartagena Protocol on Biosafety	132
I. Scope	133
1. Subject Matter: Living Modified Organisms Obtained Through Modern Biotechnology	134
a) Living Organism	135
b) Genetic Material	136
c) ‘Novel Combination’ of Genetic Material	138
d) Obtained Through the Use of Modern Biotechnology	140
aa) ‘Application of in vitro nucleic acid techniques...’	140
bb) ‘... that overcome natural physiological reproductive or recombination barriers...’	143
cc) ‘... and that are not techniques used in traditional breeding and selection’	145
e) Coverage of Certain New and Emerging Techniques	147
aa) Genome Editing	147
bb) Engineered Gene Drives	148
cc) Genetically Modified Viruses	150

dd) Techniques That Harness Natural Mechanisms of Self-Propagation (Wolbachia)	150
2. Restriction to Hazardous LMOs?	151
3. Activities Covered by the Protocol	153
4. Exemption for Transboundary Movement of LMOs Which Are Pharmaceuticals (Article 5)	155
5. Conclusions	157
II. Substantive Provisions	158
1. Advance Informed Agreement Procedure for Transboundary Movements of LMOs	159
a) Scope of the AIA Provisions	160
b) Procedure of Obtaining an Advance Informed Agreement From the Party of Import	161
c) Risk Assessment	161
d) Role of the Precautionary Principle in Decision- Making (Article 10(6))	163
e) Role of Socio-Economic Considerations in Decision- Making (Article 26)	164
f) Rules for LMOs Intended for Direct Use as Food or Feed, or for Processing (Article 11)	167
g) Exemption of Contained Use and LMO-FFP: The ‘Intended Use’ Problem	168
aa) Genuine and Disguised Changes to the Intended Use	169
bb) Responsibilities of Exporting Parties	171
cc) Responsibilities of Importing Parties	172
h) Conclusions	173
2. Risk Management and Preparedness	174
a) Risk Management (Article 16)	174
aa) Obligation to Establish Appropriate Risk Management Measures (para. 1)	174
bb) Imposition of Preventive Measures Based on Risk Assessment (para. 2)	176
cc) Prevention of Unintentional Transboundary Movements (para. 3)	177
dd) Appropriate Observation Period for Any LMO (para. 4)	181
ee) Obligation to Cooperate (para. 5)	182
b) Notification in Case of Unintentional Transboundary Movements (Article 17)	182

c) Illegal Transboundary Movements (Article 25)	184
aa) Prevention of Illegal Transboundary Movements (para. 1)	184
bb) Obligation to Dispose of the LMO in Case of an Illegal Transboundary Movement (para. 2)	186
d) Handling, Transport, Packaging, and Identification (Article 18(1))	188
e) Conclusions	189
3. Information-Sharing Through the Biosafety Clearing-House (Article 20)	190
4. Application in Relation to Non-Parties (Article 24)	192
5. Upward Derogation (Articles 2(4) and 14)	194
6. Liability and Redress (Article 27)	195
III. Conclusions	196
IV. Excursus: The Relationship Between the Cartagena Protocol and EU Biotechnology Law	197
1. The European Union's Legal Framework for GMOs	198
2. Scope of the GMO Regime in the European Union	200
3. Compatibility of the European GMO Regime With the Cartagena Protocol	202
B. Convention on Biological Diversity	205
I. Jurisdictional Scope (Article 4)	206
II. Prevention of Transboundary Harm (Article 3)	206
III. Regulation and Control of Risks Associated With the Use and Release of Living Modified Organisms (Article 8(g))	207
IV. Provision of Information to Parties Receiving LMOs (Article 19(4))	209
V. Control of Invasive Alien Species (Article 8(h))	209
VI. Impact Assessment and Minimization of Adverse Impacts (Article 14(1))	212
1. Environmental Impact Assessments (lit. a)	212
2. Procedural Obligations (lit. c and d)	213
VII. Examination of the Issue of Liability and Redress (Article 14(2))	213
VIII. Are Eradication Programmes Prohibited Under the CBD?	215
IX. Conclusions	216
C. International Trade Law	217
I. Key Provisions of International Trade Law	217

II. Agreement on Sanitary and Phytosanitary Measures: Potential Source of Conflict With the Cartagena Protocol	218
III. Resolving Potential Conflicts Between International Trade Law and the Cartagena Protocol	222
D. International Plant Protection Convention	225
E. World Organisation for Animal Health	227
F. Codex Alimentarius	229
G. United Nations Convention on the Law of the Sea	230
H. International Regulations on the Transport of Hazardous Goods	231
I. International Health Regulations	233
J. Disarmament and Humanitarian International Law	234
I. Biological Weapons Convention	235
II. ENMOD Convention	240
III. International Humanitarian Law	241
IV. Conclusions	242
K. Summary	242
 Chapter 4: Prevention of Transboundary Harm from Biotechnology Under Customary International Law	 247
A. The Legal Foundation of the Obligation to Prevent Transboundary Harm	247
B. Scope of the Obligation to Prevent Transboundary Harm	251
I. Harm	252
II. Transboundary Harm	253
1. 'Extraterritorial' Transboundary Harm	254
2. Harm to Areas Beyond National Jurisdiction	255
3. Harm to 'Global Commons'	256
III. Harm Caused by 'Physical Consequences'	258
IV. The Threshold of 'Significant' Harm	262
V. Risk of Harm	266
VI. Foreseeability of Harm and the Role of Precaution	266
1. Foreseeability as a Precondition of Prevention	266
2. The Precautionary Principle (or Approach)	267
3. Precaution and the Burden of Proof	271
4. Precaution in the Area of Biosafety	272

VII. Living Modified Organisms and the Risk of Transboundary Harm	272
1. Scholarly Opinions	273
2. Transboundary Effects of LMOs and the Notion of ‘Significant Harm’	274
3. Anticipation of Risk	277
VIII. Conclusions	277
C. Prevention of Transboundary Harm as an Obligation of ‘Due Diligence’	278
D. Procedural Duties in the Context of Prevention	281
I. Adoption and Enforcement of Effective Domestic Regulation	282
II. Environmental Impact (or Risk) Assessment	283
1. Legal Status	284
2. Triggers of the Obligation	286
3. Process and Content of EIAs	287
4. Standards for Risk Assessments of LMOs/GMOs	288
5. Conclusions	289
III. Use of the Best Available Technologies	289
IV. Cooperation	291
1. Notification	291
a) Timing	292
b) Addressees	293
c) Content	294
d) Procedure	294
2. Exchange of Information	295
3. Consultations and Negotiations	296
V. Public Participation	298
1. Legal Status Under General International Law	299
2. Public Participation Under the Cartagena Protocol	300
3. GMOs Under the Aarhus Convention	300
a) Status Quo	300
b) The GMO Amendment	301
c) The Lucca Guidelines	302
VI. Obligations When Damage Is Imminent or Inevitable	303
1. Notification in Emergency Situations	303
2. Obligation to Control and Mitigate Damage	304
VII. Conclusions	305

E. Establishing Breaches of the Obligation to Prevent Transboundary Harm	305
I. Occurrence of Harm as an Indication of a Breach	306
II. Occurrence of Harm as a Prerequisite of a Breach	308
III. Relationship Between Procedural and Substantive Obligations of Prevention	311
F. Summary	314
 Chapter 5: The International Governance of Engineered Gene Drives	 317
A. The Development of COP Decision 14/19	318
B. Legal Status of COP Decision 14/19	321
I. Functions of COP Decisions	321
II. COP Decisions as ‘Soft Law’	323
III. Soft Law Status of Decision 14/19 for Parties to the CBD	325
IV. Effect on Non-Parties	325
C. Substance, Context, and Consequences of COP Decision 14/19	326
I. Precautionary Approach (or Principle)	326
1. References to Precaution in Earlier COP Decisions	327
2. Early Deployment of Gene Drives as a Precautionary Measure?	327
3. Assessment	329
II. Preconditions for Environmental Releases of Engineered Gene Drives	329
1. Scientifically Sound Case-by-Case Risk Assessment	329
a) Status of the Obligation Under International Law	330
b) The Cartagena Protocol’s AHTEG on Risk Assessment	330
aa) Guidance on Risk Assessment and Monitoring of LMOs	331
bb) Additional Guidance on Risk Assessment of Engineered Gene Drives	333
c) Assessment	335
2. Appropriate Risk Management Measures	336
a) Status of the Obligation Under International Law	336

b) Proposed Risk Management Strategies for Gene Drives as ‘Best Available Techniques’?	336
aa) Phased Pathway to the Deployment of Gene Drives	337
bb) Self-Limiting Gene Drives	338
c) Assessment	339
3. Free, Prior and Informed Consent	339
a) Status of the Obligation Under International Law	340
aa) CBD Mo’otz Kuxtal Voluntary Guidelines	340
bb) United Nations Declaration on the Rights of Indigenous Peoples	341
cc) Assessment	342
b) Excursus: Consent of Individuals as a Human Rights Requirement?	343
4. Conclusions	346
III. Safety of Synthetic Biology in Contained Use	347
1. No Binding International Rules on LMOs in Contained Use	348
2. The WHO Laboratory Biosafety Manual	349
3. Excursus: Regulation of Gene Drives in Contained Use in the European Union	351
4. Containment Standards for Gene Drives Formulated by Researchers	353
IV. Conclusions	354
D. Governance of (Potential) Transboundary Spreads	355
I. Regulation of Transboundary Movements Under the Cartagena Protocol	356
1. ‘Likely’ Transboundary Movements as ‘Intentional’ Transboundary Movements?	356
2. Proposal for a Clarification	358
II. Transboundary Spreads and the Obligation to Prevent Significant Transboundary Harm	359
E. Summary and Outlook	361

Part Three: Operator Liability	365
Chapter 6: The Nagoya – Kuala Lumpur Supplementary Protocol on Redress and Liability	367
A. Negotiating History	368
B. Scope	373
I. Subject Matter: Living Modified Organisms	373
1. LMOs That Are Pharmaceuticals for Humans	374
2. Products Derived From LMOs	375
II. Damage to Biological Diversity	377
1. Biological Diversity	378
2. Adverse Effects on the Conservation and Sustainable Use of Biological Diversity	379
a) Adverse Effects on Conservation	380
b) Adverse Effects on Sustainable Use	381
c) Conclusions	382
3. Threshold of Damage: ‘Measurable’ and ‘Significant’	383
4. Risks to Human Health	384
5. Domestic Criteria to Address Damage	386
6. Types of Damage Not Addressed by the Supplementary Protocol	387
7. Conclusions	388
III. Damage Resulting from LMOs ‘Which Find Their Origin in a Transboundary Movement’ (Article 3(1))	389
1. Damage Resulting From Authorized Uses Following Intentional Transboundary Movement (Article 3(2))	389
2. Damage Resulting From Unintentional Movements (Article 3(3))	391
3. Damage Resulting From Illegal Transboundary Movements (Article 3(3))	392
4. Damage Resulting From Transboundary Movements From Non-Parties (Article 3(7))	392
5. Damage Resulting From LMOs in Transit	393
6. Damaged Caused by Domestic Activities With LMOs	393
7. Conclusions	394
IV. Temporal Scope (Article 3(4))	394
V. Spatial Scope (Article 3(5))	395
VI. Conclusions	397

C. Administrative Liability: Response Measures to Redress Damage to Biological Diversity	397
I. Meaning and Scope of ‘Response Measures’	399
II. Identification of the Liable Operator	401
III. Establishment of a Causal Link and Standard of Proof (Article 4)	406
IV. Implementation of Response Measures (Article 5)	409
1. Requirement of the Operator to Take Response Measures (para. 1)	409
2. Responsibilities of the Competent Authority (para. 2)	411
3. Measures When There Is a Threat of Damage (para. 3)	412
4. Response Measures Taken Instead of the Responsible Operator (para. 4)	413
5. Recovery of Expenses by the Competent Authority (para. 5)	414
6. Reasoning and Legal Review of Decisions (para. 6)	416
V. Transposition into Domestic Law	417
1. Provision of ‘Rules and Procedures That Address Damage’ (Article 12(1))	417
2. Response Measures Already Addressed by Domestic Civil Liability Law (Article 5(7))	419
3. Implementation of Response Measures ‘in Accordance With Domestic Law’ (Article 5(8))	421
VI. Conclusions	421
D. Civil Liability for Material and Personal Injury	423
I. Scope: Material or Personal Damage Associated with Biodiversity Damage	423
1. Material or Personal Damage	423
2. Damage ‘Associated’ With Biodiversity Damage	425
II. Provision of Adequate Rules and Procedures on Civil Liability (Article 12(2))	426
III. List of Elements to be Addressed When Developing Civil Liability Law (Article 12(3))	427
IV. The Meaning of ‘Adequate’ Rules and Procedures	428
V. Conclusions	429
VI. Excursus: Draft Guidelines on Civil Liability and Redress	430
E. Other Provisions	433
I. Exemptions From Liability, Time and Financial Limits, and Right of Recourse (Articles 6 to 9)	433

II. Financial Security (Article 10)	435
1. Right of Parties to Provide for Financial Security (para. 1)	436
2. Consistency of Financial Security Provisions With Existing International Law (para. 2)	438
3. Study on Financial Security Mechanisms (para. 3)	439
4. Conclusions	440
III. Relationship to State Responsibility (Article 11)	441
IV. Review of Effectiveness (Article 13)	441
V. Relationship to Rights and Obligations Under International Law (Article 16)	442
VI. Governance- and Process-Related Provisions (Articles 14 to 21)	443
F. Issues Not Addressed by the Supplementary Protocol	444
I. Transboundary Harm	444
II. Designation of a Competent Authority	445
III. Right of Affected Individuals to Request Action	446
IV. International Coordination of Response Measures	447
V. Jurisdiction, Applicable Law, and Mutual Recognition and Enforcement of Judgments	448
G. Excursus: CropLife International’s Implementation Guide	450
I. Proposed Scope of Domestic Implementing Legislation	451
II. Identification of the Liable Operator and Exemptions	451
III. Determination of Damage	452
IV. Identification of Suitable Response Measures	453
V. Civil Liability	453
VI. Conclusions	454
H. Summary and Outlook	455
Chapter 7: A Private Liability Scheme: The ‘Biodiversity Compact’	461
A. Membership	463
B. Scope	464
C. Causation, Identification of the Party Liable and Standard of Liability	465
D. Defences	467
E. Response	468
F. Financial Caps and Time Limits	469

G. Claims Process, Arbitration and Enforcement	471
H. Conclusions	473
Chapter 8: A Customary Obligation to Ensure Prompt and Adequate Compensation for Transboundary Damage?	477
A. Scope of Application and Use of Terms	478
B. Requirement to Ensure Prompt and Adequate Compensation	480
I. The Standard of 'Prompt and Adequate' Compensation	481
II. Imposition of Strict Operator Liability	482
III. Compensation Funding	483
C. Obligation to Provide for Response Measures	484
D. Obligation to Provide for International and Domestic Remedies	486
E. Relationship to the Law of State Responsibility	487
F. Legal Status: Emerging Customary International Law?	489
Part Four: Responsibility and Liability of States	493
Chapter 9: State Responsibility for Transboundary Harm Caused by Biotechnology	495
A. Requirements of the International Responsibility of a State	497
I. Conduct Consisting of an Action or Omission	498
II. Attribution	499
1. Conduct by State Organs and Persons Exercising Governmental Authority	500
2. Conduct by Persons Instructed or Controlled by the State	502
a) The Criteria for Attribution Under Article 8 ARSIWA	502
aa) Instruction	503
bb) Direction	505
cc) Control	505
b) Attribution of Private Activities Causing Transboundary Harm	510
aa) Regulatory Oversight	510
bb) Enterprises Owned and Controlled by a State	511

cc)	Research and Development Activities by Public and Governmental Institutions	514
dd)	State-Funded Research and Development Activities	516
3.	Attribution of Conduct Acknowledged and Adopted by the State as Its Own	517
4.	Attribution by Lex Specialis Norms	517
5.	Attribution of Transboundary Harm Through Human Rights Law?	518
6.	Conclusions	520
III.	Breach of an International Obligation	521
1.	International Obligation of Any Origin or Character	521
2.	Conduct in Breach of the Obligation	523
3.	No Requirement of Fault	523
IV.	Circumstances Precluding Wrongfulness	524
1.	Consent	525
2.	Self-Defence	525
3.	Countermeasures	526
4.	Force Majeure	527
5.	Necessity	528
6.	Reparation in the Event of a Circumstance Precluding Wrongfulness	531
B.	Legal Consequences of International Responsibility	533
I.	Obligations of Cessation and Non-Repetition	534
II.	Obligation to Make Full Reparation	535
1.	Recoverable Injury	536
2.	Causation	537
a)	Proof of Causality for Environmental Damage	538
b)	Harm Within the Ambit of the Rule Breached	542
c)	Concurrent Causes of Damage and 'Shared Responsibility'	542
3.	Forms of Reparation	544
a)	Restitution	544
aa)	Objective of Restitution	545
bb)	Restitution Not Materially Impossible	546
cc)	Disproportionality of Restitution	547
b)	Compensation	548
aa)	Loss of Life and Personal Injury	549
bb)	Property Damage	550
cc)	Loss of Profits or Income	551

dd) Damage to the Environment	553
ee) Punitive Damages	554
ff) Interest	555
c) Satisfaction	556
4. Contribution to the Injury and Failure to Mitigate Damage	557
III. Right to Take Countermeasures	559
C. Implementation of State Responsibility	561
I. Standing to Invoke State Responsibility	561
1. Invocation of Responsibility by Injured States	562
2. Invocation of Responsibility by Non-Injured States	565
a) Right of Non-Injured States to Invoke Responsibility	566
b) Remedies Available to Non-Injured States	569
II. Claims for Injured Nationals	571
1. The Law of Diplomatic Protection in Cases of Transboundary Harm	571
2. The Requirement to Exhaust Local Remedies in Cases of Transboundary Harm	573
III. Invocation and Enforcement of State Responsibility	577
1. The Claims Process Envisaged in the ARSIWA	577
2. Settlement of Disputes	578
3. Non-Compliance Procedures	582
a) The Compliance Mechanism Under the Cartagena Protocol	583
aa) Role, Functions and Procedures	583
bb) Recent Practice	586
cc) Legal Status	587
b) The Relationship Between Non-Compliance Procedures and State Responsibility	588
4. Conclusions	590
D. Summary and Outlook	591
Chapter 10: Strict State Liability for Transboundary Harm?	595
A. International Treaties	598
B. State Practice	604
C. Human Rights Law	609
D. International Law Commission	610

E. Conclusions	614
Chapter 11: Compensation for Environmental Damage in International Law	617
A. The Reparative Approach: Mitigating, Evaluating, and Restoring Environmental Damage	620
I. Types of Response Measures Subject to Reimbursement	622
1. Mitigation Measures	622
2. Restoration Measures	623
3. Evaluation Measures	626
II. Limitations to Compensability	628
1. Limitation to ‘Reasonable’ Measures	628
2. Limitation of Reimbursement to Incremental and Extraordinary Expenses	630
3. Limitation of Restoration Costs to the Monetary Value of the Impaired Environment?	632
III. Compensability of ‘Environmental Solidarity Costs’	632
B. The Compensatory Approach: Monetary Compensation for Damage to the Environment	633
I. Compensability of ‘Pure’ Environmental Damage	635
1. The Practice of International Liability Treaties	635
2. The Stance of the International Law Commission	637
3. Compensability of Environmental Damage in the United Nations Compensation Commission	638
4. Compensation of Environmental Damage Before the International Court of Justice (Case of Costa Rica v. Nicaragua)	639
5. Conclusions	642
II. Forms of Compensation for Damage to the Environment	643
1. Compensatory Restoration	644
2. Monetary Valuation of Environmental Damage	646
a) Valuation Based on Market Prices	647
b) Non-Market-Based Valuation Techniques	648
c) Benefit (Or Value) Transfer Method	651
d) Costs for ‘Hypothetical’ Response Measures	651
3. Conclusions	652
III. Case Study: Valuation of Environmental Damage in the ‘Certain Activities’ Case Before the ICJ	654
1. Costa Rica’s ‘Ecosystem Services Approach’	654

2. Nicaragua's 'Replacement Costs Approach'	655
3. Nicaragua's 'Corrected Analysis'	656
4. The Court's Judgment: 'Overall Assessment' of Environmental Damage	656
5. Assessment	658
C. Summary	662
Concluding Remarks	665
Summary of Results	671
Zusammenfassung in deutscher Sprache	689
Table of Cases	713
Table of Treaties and Instruments	721
Bibliography	743