

Milan Janic

Greening Airports

Advanced Technology and Operations

4y Springer

Contents

1	Introduction	1
2	Greening the Air Transport System: Structure, Concept, and Principles	5
2.1	Introduction	5
2.2	Structure of the Air Transport System	6
2.2.1	Background	6
2.2.2	Airlines	6
2.2.3	Airports	12
2.2.4	Air Traffic Control/Air Traffic Management	16
2.3	Concept of Greening the Air Transport System	20
2.3.1	Background	20
2.3.2	Aircraft Engine Fuel Consumption	21
2.3.3	Emissions of Greenhouse Gases	23
2.3.4	Impact on Global Warming and Climate Change	25
2.4	Principles of Greening the Air Transport System	29
2.5	Concluding Remarks	31
	References	32
3	Greening Airports I: Monitoring, Analysing, and Assessing	35
3.1	Introduction	35
3.2	Airports and Concept of Greening	36
3.2.1	The Main Components and Characteristics	36
3.2.2	The Main Strategies for Greening, i.e. Sustainable Development of Airports	37
3.2.3	Effects—Benefits	38
3.2.4	Impacts—Costs (Externalities)	38
3.3	Indicator System as the Core of the Methodology	49
3.3.1	Background	49
3.3.2	Prior Research	50
3.3.3	Scope and Structure	51

3.3.4 Some Applications of the Indicator System 58
 3.4 Concluding Remarks. 61
 References. 63

Greening Airports II: Transforming an Airport into a True Multimodal Transport Node. 65

4.1 Introduction. 65
 4.2 Characteristics of HSR and APT in Europe. 66
 4.2.1 Development of HS Transport Systems. 66
 4.2.2 Recent Development of APT and HSR Traffic. 67
 4.2.3 Possible Interactions. 68
 4.2.4 Some Social and Environmental Impacts of HS Transport Systems. 70
 4.2.5 Some Potential Effects of APT/HSR Substitution at Airports. 76
 4.2.6 Conditions for Implementing APT/HSR Substitution at Airports. 77
 4.3 Methodology for Assessing Effects of Substituting APT with HSR at an Airport. 78
 4.3.1 Background. 78
 4.3.2 The Structure of the Methodology. 79
 4.4 Application of Proposed Methodology. 87
 4.4.1 Input. 87
 4.4.2 Analysis of Results. 91
 4.5 Concluding Remarks. 94
 References. 95

Greening the Airport Airside Area I: Increasing Runway Capacity Without Increasing Airport Size. 99

5.1 Introduction. 99
 5.2 Advanced Technologies for Increasing Runway Landing Capacity. 100
 5.3 Advanced Procedures and Regulations for Increasing Runway Landing Capacity. 103
 5.3.1 The ATC Time-Based Separation Rules. 103
 5.3.2 Prioritising Aircraft Landings. 107
 5.3.3 The ATC Vertical Distance-Based Separation Rules 109
 5.4 A Methodology for Estimating Effects of Advanced Technologies, Procedures, and Regulations on Runway Landing Capacity. 112
 5.4.1 Background. 112
 5.4.2 The Basic Structure of the Models. 114
 5.4.3 Determining the Aircraft Inter-Arrival Time(s) at the "Reference Location". 115
 5.4.4 Criteria for Selecting ATC Separation Rules. 120

5.5	Application of Proposed Methodology.	122
5.5.1	Background.	122
5.5.2	The ATC Time-Based Separation Rules.	122
5.5.3	Prioritising Aircraft Landings.	126
5.5.4	The ATC Vertical Distance-Based Separation Rules	127
5.6	Concluding Remarks.	129
	References.	131
6	Greening the Airport Airside Area II: Liquid Hydrogen as an Alternative Fuel	133
6.1	Introduction.	133
6.2	Fuels, Aircraft, and Airport Fuel-Supply/Storage Systems.	134
6.2.1	Fuels.	134
6.2.2	Airport Fuel-Supply Systems.	139
6.3	Methodology for Assessing the Potential of Liquid Hydrogen.	141
6.3.1	Previous Research.	141
6.3.2	Objectives and Assumptions.	142
6.3.3	Model for the Air Transport System.	143
6.3.4	A Model for an Airport.	146
6.4	Application of Proposed Methodology.	149
6.4.1	Inputs-the Model for the Air Transport System.	149
6.4.2	Inputs-the Model for an Airport.	150
6.4.3	Results for the Air Transport System.	155
6.4.4	Results for the Selected Airport.	157
6.5	Concluding Remarks.	161
	References.	162
7	Greening the Airport Landside Area: Light Rail Rapid Transit Access System	165
7.1	Introduction.	165
7.2	Airport Ground Accessibility.	166
7.2.1	Background.	166
7.2.2	Accessibility Problems of Large Hub Airports.	167
7.2.3	Preferences for New Airport Ground Access Systems	169
7.3	Light Rail Rapid Transit as an Airport Ground Access System.	171
7.3.1	Background.	171
7.3.2	The Light Rail Rapid Transit System Performance.	172
7.4	Methodology for Assessing the Environmental Potential of the Light Rail Rapid Transit System at an Airport	176
7.4.1	Background.	176
7.4.2	Previous Research	177
7.4.3	The Objectives and Assumptions.	178
7.4.4	The Basic Structure.	179

7.5	Application of the Proposed Methodology.	185
7.5.1	The Case of a Large Airport: Amsterdam Schiphol (The Netherlands).	185
7.5.2	The Prospective Environmental Potential of the New Light Rail Rapid Transit System.	196
7.6	Concluding Remarks.	198
	References.	198
8	Conclusions: Could Airports Really Become Greener?	201
	Author Biography.	203
	Glossary.	205