

CONTENTS

	Page
PREFACE	vii
SUMMARY	3
I. INTRODUCTION	15
A. Discussion of Major Issues	15
B. Congressional Concern for Materials Information	16
C. Assessment Approach	17
II. INFORMATION REQUIREMENTS OF THE U.S. MATERIALS SYSTEM	21
A. Introduction	21
B. Materials in the U.S. Economy	22
C. Materials Decisionmaking	24
1. Decisionmaking Complexity	24
2. Decisionmaking in the Marketplace	24
3. Decisionmaking in the Federal Government	27
D. Existing Materials Information Systems	31
1. Scientific and Technical Information	32
2. Technical Trade Information	35
3. Inventory and Economic Information	36
4. Information Handling	36
E. Summary	42
F. References	42
III. THE NEED FOR IMPROVING FEDERAL MATERIALS INFORMATION SYSTEMS CAPABILITIES	47
A. introduction	47
B. Literature Review	48
1. The President's Materials Policy Commission Report	48
2. The National Commission on Materials Policy Report	49
3. The COSMAT Report	50
4. The National Materials Advisory Board Surveys	50
5. GAO Report on Commodity Shortages	52
6. The Federation of Materials Societies Survey	55
7. Prospective Functional Requirements of an Improved System	56
C. Review offending Legislation	58
D. Interviews with Materials Decisionmakers	58
1. Senior Level Executives	59
2. Aluminum Specialists	62
E. Foreign Materials Information Systems	71
F. Improved Functional Requirements	75
1. Functional Requirements—Supply	75
2. Functional Requirements—Utilization	76
3. Functional Requirements—Supply/Utilization	77

G. Integration of Functional Requirements	78
1! Supply Considerations.	79
2. Utilization Considerations.	81
3. Supply/Utilization Interrelationship and Management Actions	81
4. Evolution of Capabilities.. . . .	83
H. Summary	88
I References.	89
IV. POTENTIAL OF EXISTING FEDERAL MATERIALS INFORMATION SYSTEMS TO SUPPORT THE INTEGRATED CAPABILITIES.	93
A. Introduction	93
B. Congressional Information Systems	94
C. Executive Materials Information Systems	96
1. Data Bases and Information Management Systems.	96
2. Mathematical/Analytical Models	102
D. Required Improvements in Materials Information Systems	109
1. Completeness of Data Bases	109
2. Accessibility	109
3. Standardization	110
4. Reliability/Accuracy.	110
5. Timeliness	110
6. Statistical/Analytical Capability	110
E. Summary	111
V. OPTIONS FOR ACHIEVING THE INTEGRATED CAPABILITIES	115
A. Introduction	115
B. Legislative and Executive Implementing Options	116
1. Evolution of Current Systems Without Direct Action	116
2. Legislative Branch Options Short of New Authorizing Legislation	117
3. Executive Branch Options Short of New Authorizing Legislation	120
4. Options Through Legislation	121
C. Alternative Information Systems Approaches	122
1. Approach A: Coordinated Systems Evolution	125
2. Approach B: Directed, Step-by-Step Upgrading of Existing Information Systems \$ \$..... O. O F	128
3. Approach C: New Information System	140
D. Cost Estimates	145
1. Data Collection Costs	147
2. Approach A: Development, Automation, and Operation Costs	148
3. Approach B: Development, Automation, and Operation Costs	148
4. Approach C: Development, Automation, and Operation Costs	150
E. Summary	151
1. Approach A....	152
2. Approach B	153
3. Approach C	154
VI ALTERNATIVE INSTITUTIONAL ARRANGEMENTS FOR IMPLEMENTING THE IMPROVED CAPABILITIES	159
A. Introduction	159

B.	Institutional Arrangements	160
1.	Institutional Arrangements for Incremental Improvement of Existing Systems. 0	160
2.	Institutional Arrangements for Major Improvements in Existing Systems: An Executive Branch Location	163
3.	Location in the Legislative Branch	173
4.	Location in the Private Sector	173
C.	Selected Implementation Alternatives	176
1.	Rationale for Specific Alternatives	176
2.	Selected Implementation Alternatives	178
/II. ANALYSIS OF POSSIBLE IMPACTS		185
A.	Introduction	186
B.	Impacts on Government	186
1.	Support for Governmental Planning and Priority Selection	186
2.	Increased Ability of Decisionmakers to Cope with Materials Problems.	187
3.	Possible Improvement in Relationships Between Federal State, and Local Governments.	188
4.	Changes in the Distribution of Influence and Responsibility Among Federal Agencies.	188
5.	Support for Increased Public Participation in Decisionmaking.	189
C.	Impacts on the Economy	189
1.	Improved Ability of the Private Sector to Meet National Needs for Materials	190
2.	Clarification of Materials Substitution and R&D Options	190
3.	Support for Industrial Planning	191
4.	Changes in the Competitiveness of the Materials Industry.	191
5.	Stimulus to Governmental/Industrial Cooperation in Materials Policy Development and Implementation	192
6.	Clarification of Consumer Choices.	192
7.	Contribution to Land Use and Regional Planning	192
D.	Social Impacts	193
1.	Improved Materials Information Management.	193
2.	Increased Access to Materials Information	193
3.	Concern Over Individual and Corporate Privacy and Control of Information	194
4.	Movement Toward Futures Research and Interest in Alternative Futures.	195
5.	Media Treatment of Materials-Related National Problems	195
E.	Impacts on International Policymaking	196
1.	Awareness of Need for International Materials Information.	196
2.	Operation of Multinational Corporations.	196
3.	Increased Ability to Cope with International Materials Cartels.	197
4.	Improved Basis for Foreign Policy on Materials and Trade	197
5.	Stimulation of Use of Satellites for Information Purposes	197
6.	Support for International Discussion of Materials-Related Problems	197
F.	Impacts on Public Law.....	198
1.	Submission and Validation of Materials Data.	198
2.	Exchange of Materials Information by Government Agencies.	199
3.	Application of the Freedom of Information Act to Data in Materials Information Systems 0	200
4.	Revision of Reporting Requirements for Materials-Related Industries	201
5.	Promotion of Other National Policies and Programs	201

G. Impact of Alternative Levels of Improvement	202
1. Incremental Level	202
2. Intermediate Level	202
3. Maximum Level	203
H. Overall Summary of Impacts	205
1. Impacts Judged To Be Beneficial	205
2. Impacts Judged To Be Mixed	205
3. Impacts Judged To Be Detrimental	206
4. Conclusions Regarding Possible Impacts	206
VIII. IDENTIFICATION AND ANALYSIS OF POLICY ISSUES	211
A. Introduction	211
B. Role of the Federal Government with Respect to Private Sector Materials Information	212
C. Authority of the Federal Government to Require Disclosure of Materials Information	213
1. Sources of Federal Jurisdiction	213
2. Limitations on Exercise of Federal Authority	213
3. Conclusion	214
D. Openness in Government and the Protection of Confidential Business Information	214
1. Public Access to Information	214
2. Protection of Confidential Business Information	214
3. Conclusions	216
E. Distribution and Control of Materials Information in Society	217
F. Competition within the American Economy	218
1. Materials Substitution	218
2. Materials Research and Development	218
3. Industrial and Business Planning	219
4. Competition Among Smaller Versus Larger Firms	219
5. Role of the Federal Government	219
6. Conclusion	220
G. The Growth of Governmental Planning	220
1. Public Planning in the United States	220
2. Materials Planning at the Federal Level	221
3. State/Local Materials Planning	221
H. The Future of Intergovernmental Relations	222
1. American Federalism and Materials Problems	222
2. Intergovernmental Cooperation	222
3. Intergovernmental Friction	222
4. Conclusions	223
I. Participation in the Political Process	223
1. Role of Information	223
2. Reduced Barriers to Participation	224
3. Wider Range of Participation	224
4. Conclusions	225
APPENDICES	
Appendix A—Materials Substitutability	229

A. Introduction	229
B. Decisions and Decisionmakers	231
C. The Process of Substitution Analysis	232
1. Materials Users	232
2. National Policymakers.	236
D. Information Requirements for Substitution Analysis	241
Appendix B—Acronyms	247

LIST OF TABLES

1. Selected Examples of Government Materials Activities	4
2. Alternative Institutional Arrangements	8
1-1. Needs Identified in Major Materials-Related Legislation	17
11-1. The Materials-Oriented Sectors of the Economy	23
II-2. Factors Tending to Diminish Supply.	28
11-3. Some Examples of Government Materials Activities	29
II-4. Possible Government Actions in Regard to Mineral or Material Production and Consumption	30
11-5. Examples of Elements Within Existing Materials Information Systems	32
II-6. Some Materials-Oriented Information Analysis Centers.	38
11-7. Large, Medium, and Small Specialized Materials Information Analysis Centers	40
111-1. National Materials Advisory Board Study of Information Analysis Centers	52
III-2. Selected Results of FMS Survey.	58
111-3. References to Functional Requirements in Principal Materials Studies	59
111-4. Prospective Functional Requirements Reflected in Legislation of 93rd and 94th Congresses	60
111-5. Materials Executives Interviewed	61
111-6. Importance of Functional Objectives as Viewed by Materials Executives	62
III-7. Information Systems Used by Aluminum Survey Respondents	64
III-8. Representative Test Questions	69
III-9. Reported Coverage of Aluminum Data Bases by Component of the Materials Cycle.	70
III-10. Accuracy of Aluminum Data Bases.	71
111-11. Aluminum Community Perceived Need for an Improved Materials Information System	72
111-12. Functional Requirements Cited by Aluminum Specialists	73
111-13. Level of Concern for the Indirect Functional Requirements	74
IV-1. Congressional Agencies Serving Legislative Information Needs.	95
IV-2. Agency Personnel Interviewed During Survey.	97
IV-3. Institutional Characteristics of Selected Data Bases and Associated Information Management Systems	98
IV-4. Content Characteristics of Selected Data Bases.	99
IV-5. Data Collection and Handling Characteristics of Selected Data Bases	100
IV-6. Data Maintenance and Reporting Characteristics of Selected Data Bases and Associated Information Management Systems.	101
IV-7. Mathematical/Analytical Models Surveyed	103
IV-8. Criticality of Problem Areas in Selected Systems.	109

LIST OF TABLES (con't)

V-1.	Possible Advantages and Disadvantages of Legislative Branch Options Short of New Authorizing Legislation.	119
v-2.	Possible Advantages and Disadvantages of Executive Branch Options Short of New Authorizing Legislation.,	120
V-3,	Possible Advantages and Disadvantages of Options Through Legislation	121
V-4,	Summary of Alternative Systems Approaches	123
V-5.	Approach B Development Schedule	149
V-6,	Approach B Costs.	150
V-7.	Approach C Development Schedule	151
V-8.	Approach Costs.,	152
VI-1,	Possible Advantages and Disadvantages of a Materials Information Referral Office.....	162
VI-2.	Possible Advantages and Disadvantages of an Location in an Existing Executive Department or Agency.	165
VI-3.	Possible Advantages and Disadvantages of a Location Within a New Natural Resources Department,	166
VI-4.	Possible Advantages and Disadvantages of Location Within a New Statistical Agency.....	168
VI-5.	Possible Advantages and Disadvantages of Location Within the Executive Office of the President.	169
VI-6,	Possible Advantages and Disadvantages of Location in an Independent Agency or Commission	170
VI-7.	Possible Advantages and Disadvantages of Location in a Quasi-Governmental Institution.....	172
VI-8,	Possible Advantages and Disadvantages of a Location Within the Legislative Branch or Private Sector	174
VI-9.	Summary of the Institutional Arrangements.	180
VI-10.	Summary of Key Components of Implementation Alternatives	181
VI-11.	Institutional Arrangements	182
A-1.	Examples of Substitution Involving Various Classes of Materials	230
A-2.	Examples of Three Broad Classes of Substitution..	231
A-3.	Potential Users of Information on Substitution.	231
A-4.	Examples of Motivations for Substitution..	232
A-5.	Information Requirements for Substitution Analysis	242
A-6.	Information Requirements for Substitution Analysis: Those Specifically Required by Materials Users are Underlined.	245
A-7.	Information Requirements for Substitution Analysis: Those Specifically Required by National Policymakers are Underlined	246

LIST OF FIGURES

11-1.	Materials Cycle.....	22
11-2.	Expenditures and Sales of Copper and Zinc Industries.....	25
11-3.	Aluminum Cycle.....	26
II-4.	Categories of Materials Information.....	33
II-5.	Flow of Information Through the Materials Cycle.....	34
111-1.	DOD Materials Information Centers—Relative Use by Type of Organization. . .	53
III-2.	Tools or Techniques for Acquiring Information for Various Types of Needs. . .	54
111-3.	Distribution of Respondents to FMS Survey.....	57
111-4.	Basic Framework for Interrelating Elements of Materials Information.....	80
111-5.	Basic Informational Framework Showing Selected Policy Actions.....	82
111-6.	Basic Informational Framework Applied to Materials Substitution.....	84
111-7.	Aluminum Information Sources for Supply Functions.....	86
III-8.	Aluminum Information Sources for Utilization Functions.....	87
IV-1.	Econometric Regression Model Information Flow Summary.....	104
IV-2.	Input/Output Model Information Flow Summaries.....	105
IV-3.	Linear Programming Model Information Flow Summary.....	106
IV-4.	Concept of a Break-Integrated Policy Analysis System.....	108
v-1.	Approach B, Step 1—Materials Referral Service	129
v-2.	Approach B, Step 2—Clearinghouse and Materials Information Exchange Service.....	133
V-3.	Approach B, Step 3—Summary Data Base and Statistical Services	137
V-4.	Adaptive System	143
A-I.	Information Requirements for Substitution Analysis by Materials Users.....	233
A-2.	Information Requirements for Substitution Analysis by National Policymakers.....	237