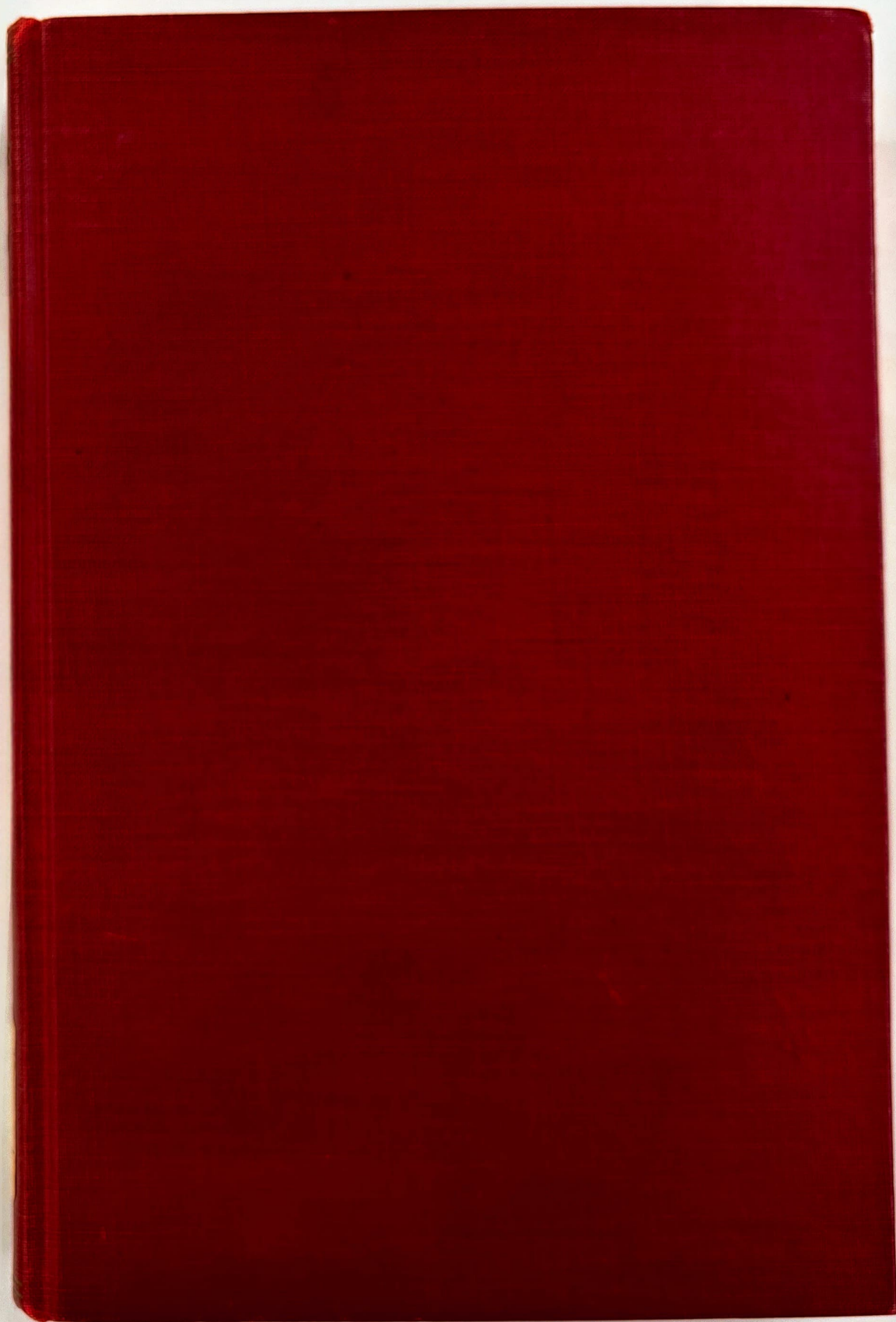


THE  
BOULDER  
CANYON  
PROJECT



KLEINSORGE

TC  
425  
C6K6  
SOCIAL  
SCIENCES



# THE BOULDER CANYON PROJECT

Historical and Economic Aspects

*By*

**PAUL L. KLEINSORGE**

*Assistant Professor of Economics and Business Administration  
Oregon State College*

*With a Foreword by*

**ELIOT JONES**

*Professor of Public Utilities  
Stanford University*

**Stanford University Press – Stanford University, California**

**London: Humphrey Milford – Oxford University Press**

STANFORD UNIVERSITY PRESS  
STANFORD UNIVERSITY, CALIFORNIA

LONDON: HUMPHREY MILFORD  
OXFORD UNIVERSITY PRESS

---

THE BAKER AND TAYLOR COMPANY  
55 FIFTH AVENUE, NEW YORK

THE MARUZEN COMPANY  
TOKYO, OSAKA, KYOTO, SENDAI

---

COPYRIGHT 1941 BY THE BOARD OF TRUSTEES  
OF THE LELAND STANFORD JUNIOR UNIVERSITY

PRINTED AND BOUND IN THE UNITED STATES  
OF AMERICA BY STANFORD UNIVERSITY PRESS

S S R S

Add'l

GIFT

## TABLE OF CONTENTS

|                                                                    | PAGE |
|--------------------------------------------------------------------|------|
| CHAPTER I. CONDITIONS LEADING TO THE PROJECT . . .                 | 1    |
| Introduction . . . . .                                             | 1    |
| Description of the Colorado River . . . . .                        | 2    |
| Comparative Size . . . . .                                         | 2    |
| Geography . . . . .                                                | 4    |
| Characteristics of the Stream . . . . .                            | 9    |
| Changes in Volume of Water Carried . . . . .                       | 9    |
| Quantities of Silt Carried . . . . .                               | 11   |
| History of Development of the Lower River . . . . .                | 15   |
| Navigation . . . . .                                               | 15   |
| Agricultural Development . . . . .                                 | 19   |
| Imperial Valley . . . . .                                          | 20   |
| Mexican Lands . . . . .                                            | 30   |
| Coachella Valley . . . . .                                         | 31   |
| Yuma Project . . . . .                                             | 32   |
| Palo Verde Valley . . . . .                                        | 34   |
| Other Irrigable Areas . . . . .                                    | 36   |
| Flood Control . . . . .                                            | 37   |
| Power Development . . . . .                                        | 52   |
| CHAPTER II. THE COLORADO RIVER COMPACT . . . . .                   | 55   |
| Drafting the Compact . . . . .                                     | 55   |
| Analysis of the Compact . . . . .                                  | 59   |
| The Arizona Controversy . . . . .                                  | 66   |
| The Six-State Compact . . . . .                                    | 70   |
| CHAPTER III. THE BOULDER CANYON PROJECT ACT . . . . .              | 75   |
| Legislative History . . . . .                                      | 75   |
| Analysis of the Boulder Canyon Project Act . . . . .               | 80   |
| Purposes and Uses . . . . .                                        | 80   |
| Hoover (Boulder) Dam . . . . .                                     | 84   |
| All-American Canal . . . . .                                       | 87   |
| Power Development . . . . .                                        | 89   |
| Financial Plan for the Dam and Appurtenant<br>Structures . . . . . | 92   |

|                                                  | PAGE |
|--------------------------------------------------|------|
| Compacts . . . . .                               | 98   |
| Rights to Water and Electric Power . . . . .     | 101  |
| Investigations . . . . .                         | 102  |
| Conditions . . . . .                             | 103  |
| Arguments of the Opposition . . . . .            | 105  |
| State versus Federal Control . . . . .           | 106  |
| Government in the Power Business . . . . .       | 113  |
| The Mexican Situation . . . . .                  | 116  |
| Constitutionality of the Boulder Canyon Project  |      |
| Act . . . . .                                    | 123  |
| Legal Aspects . . . . .                          | 123  |
| Litigation . . . . .                             | 131  |
| CHAPTER IV. CONTRACTS AND FINANCE . . . . .      | 137  |
| Cost Estimates . . . . .                         | 138  |
| Contracts for Power . . . . .                    | 140  |
| Determination of Rates . . . . .                 | 140  |
| Drafting of the Power Contracts . . . . .        | 146  |
| Legal Aspects and Controversial Points . . . . . | 154  |
| Contracts for Water . . . . .                    | 167  |
| Determination of Rates . . . . .                 | 167  |
| Drafting of the Water Contracts . . . . .        | 169  |
| Legal Aspects and Controversial Points . . . . . | 173  |
| Summary of the Project Revenues . . . . .        | 182  |
| CHAPTER V. CONSTRUCTION PROBLEMS . . . . .       | 185  |
| Construction at Black Canyon . . . . .           | 186  |
| Hoover (Boulder) Dam . . . . .                   | 186  |
| Selection of the Site . . . . .                  | 186  |
| Criticism of the Construction Plan . . . . .     | 190  |
| Preliminary Construction . . . . .               | 194  |
| Specifications . . . . .                         | 198  |
| Contracts . . . . .                              | 204  |
| Building of the Dam . . . . .                    | 206  |
| The Power Plant . . . . .                        | 214  |
| Boulder City . . . . .                           | 219  |
| Comparison with Other Projects . . . . .         | 226  |

## CONTENTS

xiii

|                                                                          | PAGE |
|--------------------------------------------------------------------------|------|
| Construction of the All-American Canal and the Imperial Dam . . . . .    | 230  |
| The All-American Canal . . . . .                                         | 230  |
| Imperial Dam . . . . .                                                   | 234  |
| Construction of the Colorado River Aqueduct and the Parker Dam . . . . . | 236  |
| The Colorado River Aqueduct . . . . .                                    | 236  |
| Parker Dam . . . . .                                                     | 242  |
| CHAPTER VI. ECONOMIC EVALUATION OF THE PROJECT'S SERVICES . . . . .      | 245  |
| Flood Control and River Regulation . . . . .                             | 246  |
| Water for Agricultural Use . . . . .                                     | 257  |
| Water for Domestic Use . . . . .                                         | 272  |
| Generation of Electric Power . . . . .                                   | 281  |
| The Project as a Relief Measure During a Period of Depression . . . . .  | 300  |
| Services of the Project as a Pleasure Resort . . . . .                   | 305  |
| Colorado River Basin Investigations . . . . .                            | 309  |
| Summary . . . . .                                                        | 311  |
| BIBLIOGRAPHY . . . . .                                                   | 312  |
| INDEX . . . . .                                                          | 325  |

## LIST OF TABLES

| TABLE                                                                            | PAGE |
|----------------------------------------------------------------------------------|------|
| I. Some Important Rivers of the United States . . .                              | 3    |
| II. Drainage Basin Area by Stream Basins . . . .                                 | 6    |
| III. Drainage Basin Area by States . . . . .                                     | 7    |
| IV. Average Discharge of Principal Tributaries . . .                             | 10   |
| V. Lower Basin—Acreage Irrigated and Irrigable in the Future . . . . .           | 22   |
| VI. Acreage Irrigated in Colorado River Basin, by Political Boundaries . . . . . | 56   |
| VII. Estimated Cost of Boulder Canyon Power . . .                                | 145  |

| TABLE                                                                                                                         | PAGE |
|-------------------------------------------------------------------------------------------------------------------------------|------|
| VIII. Annual Cost of Boulder Canyon Power at Pacific Coast Terminal Substations Compared with Steam-Generated Power . . . . . | 146  |
| IX. Disposition of Boulder Canyon Power . . . . .                                                                             | 152  |
| X. Firm-Power Revenues of the Boulder Canyon Project . . . . .                                                                | 155  |
| XI. Power and Water Revenues of the Boulder Canyon Project . . . . .                                                          | 184  |
| XII. Hoover (Boulder) Dam Compared with Other Great Dams . . . . .                                                            | 228  |

## LIST OF ILLUSTRATIONS

|                                                                        | PAGE |
|------------------------------------------------------------------------|------|
| FRONTISPIECE. Hoover Dam . . . . . <i>facing</i>                       | iii  |
| FIGURE 1. Colorado River Basin . . . . . <i>facing</i>                 | 3    |
| FIGURE 2. Colorado River Basin below Hoover (Boulder) Dam . . . . .    | 23   |
| FIGURE 3. Plan of Hoover (Boulder) Dam and Appurtenant Works . . . . . | 200  |
| FIGURE 4. Hoover (Boulder) Dam and Power Plant . .                     | 201  |