Downloaded from UvA-DARE, the institutional repository of the University of Amsterdam (UvA) http://hdl.handle.net/11245/2.56130

File IDuvapub:56130FilenameTable of ContentsVersionunknown

| SOURCE (OF | R PART OF THE FOLLOWING SOURCE): |
|-----------------|--|
| Туре | PhD thesis |
| Title | To cooperate or not to cooperate? : collective action for rehabilitation of traditional water tunnel systems (qanats) in Syria |
| Author(s) | J.I. Wessels |
| Faculty Year | FMG: Amsterdam Institute for Social Science Research (AISSR) 2008 |

FULL BIBLIOGRAPHIC DETAILS: http://hdl.handle.net/11245/1.288733

Copyright

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content licence (like Creative Commons).

UvA-DARE is a service provided by the library of the University of Amsterdam (http://dare.uva.nl) (pagedate: 2014-11-17)

Table of Contents

| GLOS | SARY OF LOCAL TERMS | 9 |
|---------------------------|--|----|
| ACKN | NOWLEDGEMENTS | 12 |
| СНАН | TER 1 INTRODUCTION | 17 |
| Introd | luction | 17 |
| 1.1 | Short introduction to Syria | 18 |
| 1.2 | What are qanats ? | 19 |
| 1.3 | Research on qanats since mid 20 th century | 22 |
| 1.4 | From science to practical application | 24 |
| 1.5 | Placing qanats in a development context | 27 |
| Organization of this book | | 30 |
| CHAR | TER 2 COLLECTIVE ACTION FOR COMMUNITY | 21 |
| Introd | LR MANAGEMENT, A HUMAN ECOSYSTEM APPROACH | 31 |
| | | |
| 2.1 | Qanats as a complex human ecosystem | 34 |
| 2.1. | l Including humans into ecosystems | 36 |
| 2.1. | 2 Why a human ecosystem approach for qanats ? | 39 |
| 2.1. | 3 Conceptualising the complexity of qanats as human ecosystems | 42 |
| 2.1. | 4 Multiple environments and a scaled hierarchy of systems | 44 |
| 2.1. | 5 Potential shortcomings of the "new" human ecosystems approach | 47 |
| 2.2 | Studying collective action, a forest of theoretical debates | 50 |
| 2.2. | 1 Limitations of New Institutionalism | 52 |
| 2.2. | 2 The role of power in every day water politics | 53 |
| 2.2. | 3 Leadership and governance for community-based natural resource | |
| | management | 55 |
| 2.2. | 4 The relationship between collective action and water scarcity | 57 |
| 2.2. | 5 Analysing the orientation-to-action of individual actors | 60 |
| 2.3 collect | The importance of information flows in human ecosystems and ive action | 63 |

| 2.3. | 1 Communication and the cultural dimension | 63 |
|--------|---|-----|
| 2.3.2 | 2 The role of communication in participation | 65 |
| 2.3.3 | 3 Community-feedback and reflection of observation; using | |
| | Participatory Video (PV) | 67 |
| 2.3.4 | 4 Important lessons from visual anthropology for the application of | |
| 2.3. | video | 70 |
| | VIGCO | 70 |
| | | |
| CHAP | TER 3 RESEARCH FRAMEWORK | 74 |
| Introd | uction | 74 |
| | | |
| 3.1 | Problem analysis | 74 |
| | | |
| 3.2 | Research questions & objectives | 76 |
| | Field mothed allows and annual all | 77 |
| 3.3 | Field methodology and approach | // |
| 34 | Cases of Collective Action: ganat renovations | 78 |
| 3.1 | Pilot renovation: dynamics at micro level in Shallalah Saghirah | 70 |
| 2.4 | 2 Oard reportion: a case of unintended affect | 82 |
| 5.4.2 | 2 Qaran renovation, a case of unintended effect | 82 |
| 3.5 | Participatory video (PV) and community feedback | 86 |
| | | |
| СПАВ | TED A COMMINIWATED AND GANATS IN SVDIA | 99 |
| UIIAI | TER 4 GROUNDWATER AND QANATS IN STRIA | 00 |
| Introd | uction | 88 |
| | | |
| 4.1 | Status of flowing Qanats in Syria | 88 |
| 4.1. | 1 Distribution of flowing ganats throughout Syria | 89 |
| 4.1.2 | 2 Short historical background of Syrian Qanats | 90 |
| 4.1.3 | 3 Ecology, characteristics and different types of ganats | 92 |
| 4.1.4 | 4 Ownership, leadership and abandonment of ganats: state and fate | 94 |
| 4.1.5 | 5 Laws, rights and regulations for quant use | 99 |
| | | |
| 4.2 | Groundwater resources, policy and institutional reform in Syria | 101 |
| 4.2. | 1 Challenges per groundwater sector | 102 |
| 4.2.2 | 2 Institutional reform and Syrian water legislation | 103 |
| 4.2.3 | 3 Qanats versus pumps, competing for the aquifer | 105 |
| 13 | Conducions | 106 |
| 4.3 | Conclusions | 100 |
| СПАВ | | 100 |
| UHAP | IER Ə ƏNALLALAN ƏAGHIKAH | 109 |
| Introd | uction | 109 |
| | | |

| 5.1 Bac | kground of the site and its qanat | 110 |
|--|---|--|
| 5.1.1 | Shallalah Saghirah, small village on the fringe of the Syrian steppe | e |
| | | 110 |
| 5.1.2 | Historical background and development of qanats around the pilot | t |
| | site | 112 |
| 5.1.3 | Physical characteristics and hydrogeology of the qanat in Shallala | h |
| | Saghirah | 116 |
| 5.1.4 | Early modern use of the <i>qanat</i> | 123 |
| 5.1.5 | Present groundwater use near the <i>qanat</i> | 123 |
| 5.2 The | e users community of Shallalah Saghirah | 125 |
| 5.2.1 | Household characteristics | 125 |
| 5.2.2 | History of settlement in the village | 133 |
| 5.2.3 | Water rights and landownership in the irrigated garden | 136 |
| 5.2.4 | A conflict between households | 144 |
| 5.2.5 | Sociopolitical history of family ties between households | 144 |
| 5.2.6 | The importance of identity and marriage links as sources of power | |
| | and mediation | 149 |
| 5.2.7 | Transformations in society | 153 |
| 53 Co | aclusions | 155 |
| 5.5 CU | | 155 |
| СНАРТЕН | 86 SHALLALAH SAGHIRAH RENOVATION | 157 |
| | | |
| Introducti | | 157 |
| Introducti | on | 157 |
| Introduction | on e pilot renovation of summer 2000 | 157 159 |
| Introduction 6.1 The 6.1.1 | on e pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) | 157 159 159 |
| Introduction 6.1 The 6.1.1 6.1.2 | on e pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation | 157 159 159 162 |
| 6.1 The 6.1.1 6.1.2 6.1.3 | e pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation | 157 159 159 162 164 |
| 6.1 The 6.1.1 6 .1.2 6 .1.3 6 .1.4 | e pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action | 157 159 162 164 170 |
| 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 | e pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors | 157 159 162 164 170 176 |
| Introduction 6.1 The 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 | e pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work | 157 159 162 164 170 176 179 |
| 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 | e pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest | 157 159 162 164 170 176 179 181 |
| 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 | e pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities | 157 159 162 164 170 176 179 181 184 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict | 157 159 162 164 170 176 179 181 184 187 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 6.1.10 | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict Workers group dispersed and resolution process of the "case of the | 157 159 162 164 170 176 179 181 184 187 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 6.1.10 | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict Workers group dispersed and resolution process of the "case of the thorn" | 157 159 162 164 170 176 179 181 184 187 2 188 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 6.1.10 6.1.11 | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict Workers group dispersed and resolution process of the "case of the thorn" The last weeks, finishing the task | 157 159 162 164 170 176 179 181 184 187 1 88 191 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 6.1.10 6.1.11 6.2 End | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict Workers group dispersed and resolution process of the "case of the thorn" The last weeks, finishing the task | 157 159 162 164 170 176 179 181 184 187 2 1 88 191 193 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 6.1.10 6.1.11 6.2 End 6.2.1 | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict Workers group dispersed and resolution process of the "case of the thorn" The last weeks, finishing the task | 157 159 159 162 164 170 176 179 181 184 187 * 188 191 193 194 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 6.1.10 6.1.11 6.2 End 6.2.1 6.2.2 | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict Workers group dispersed and resolution process of the "case of the thorn" The last weeks, finishing the task | 157 159 159 162 164 170 176 179 181 184 187 188 191 193 194 197 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 6.1.10 6.1.11 6.2 End 6.2.1 6.2.2 6.2.3 | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict Workers group dispersed and resolution process of the "case of the thorn" The last weeks, finishing the task Bogenous factors of collective action at community level Public scrutiny, mistrust and conflicting loyalties Communication between the actors Power, equity, water rights and legal pluralism | 157 159 162 164 170 176 179 181 184 187 188 191 193 194 197 200 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 6.1.10 6.1.11 6.2 End 6.2.1 6.2.2 6.2.3 6.2.4 | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict Workers group dispersed and resolution process of the "case of the thorn" The last weeks, finishing the task Hogenous factors of collective action at community level Public scrutiny, mistrust and conflicting loyalties Communication between the actors Power, equity, water rights and legal pluralism Empowering and participation in the rural Middle East; a critical | 157 159 162 164 170 176 179 181 184 187 188 191 193 194 197 200 |
| Introduction 6.1 The 6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7 6.1.8 6.1.9 6.1.10 6.1.11 6.2 End 6.2.2 6.2.3 6.2.4 | pilot renovation of summer 2000 The Khanasser Valley Integrated Research Site (KVIRS) Main actors of the renovation The challenge of renovation Preparations for collective action Orientation-to-action; multiplicity of actors The first few weeks, villagers claiming their right to work Supervision during the work and conflicts of interest Shifting responsibilities Migration workers returning from Lebanon, tensions and conflict Workers group dispersed and resolution process of the "case of the thorn" The last weeks, finishing the task Hogenous factors of collective action at community level Public scrutiny, mistrust and conflicting loyalties Communication between the actors Power, equity, water rights and legal pluralism Empowering and participation in the rural Middle East; a critical view | 157 159 159 162 164 170 176 179 181 184 187 188 191 193 194 197 200 207 |

| 6.2.6 | Cost-benefit analysis of the pilot renovation | 214 | |
|-------------|--|-----|--|
| 6.3 Coi | nclusions | 217 | |
| СНАРТЕН | QARAH | 219 | |
| Introducti | Introduction 219 | | |
| 7.1 Bac | kground of the site of Oarah and its ganats. | 219 | |
| 7.1.1 | Qarah, an old settlement near the Lebanese mountains | 220 | |
| 7.1.2 | Hydrogeology of Qarah | 222 | |
| 7.1.3 | General characteristics and development of qanats in Qarah | 225 | |
| 7.1.4 | Discharge of the qanats | 226 | |
| 7.1.5 | Groundwater use around the qanats | 232 | |
| 7.1.6 | Irrigated Areas of the Qanats based on Landsat TM image | 236 | |
| 7.1.7 | 'Ayn al Taybeh, the Qanat of Dayr Mar Yaqub | 238 | |
| 7.1.8 | The maintenance status of qanat 'Ayn al Taybeh in 2002 | 246 | |
| 7.2 The | e user community of Qarah | 248 | |
| 7.2.1 | Socio-economic characteristics | 249 | |
| 7.2.2 | User rights, irrigation management and organisation | 250 | |
| 7.2.3 | Investment attitudes and orientation to collective action | 254 | |
| 7.2.4 | Community suggestions for improvement | 257 | |
| 7.3 Co | nclusions | 258 | |
| СНАРТЕН | R 8 QARAH RENOVATION | 260 | |
| Introducti | on | 260 | |
| 8.1 The rea | 10vation in Qarah from September 2003-April 2004 | 260 | |
| 8.1.1 | Previous qanat renovations in the Qalamun basin | 263 | |
| 8.1.2 | Main actors of the renovation | 265 | |
| 8.1.3 | The power of video feedback | 269 | |
| 8.1.4 | Preparations of collective action | 272 | |
| 8.1.5 | Execution of the renovation | 276 | |
| 8.2 End | logenous and exogenous factors of collective action | 280 | |
| 8.2.1 | Leadership and power | 280 | |
| 8.2.2 | Social relations at user community level | 283 | |
| 8.2.3 | The role of third parties and funding agencies | 285 | |
| 8.2.5 | Hydrogeological impact of the renovation | 287 | |
| 8.2.6 | Cost-benefit analysis of the Qarah renovation | 288 | |
| 8.3 Cor | nclusions | 293 | |

| CHAPTE | R 9 | COMPARISON AND CONCLUSION | 295 |
|---------------------------------|----------------------------------|--|-------------------|
| Introducti | on | | 295 |
| 9.1 An 9.1.1 9.1.2 | alysing qa Element The hun | anats as human ecosystems s of the qanat as human ecosystem at community level han ecosystem at regional level; are pumps and ganats | 296 297 |
| 2.1.2 | compati | ble? | 304 |
| 9.2 Co | mparison | of socio-cultural and biophysical elements at each cas | e |
| study site | | | 306 |
| 9.2.1 | Bio-phy | sical elements | 309 |
| 9.2.2 | Socio-ci | iltural elements | 312 |
| 9.3 En | ergy inpu | t into the human ecosystem – collective action, mediat | or |
| roles and e | external a | gency | 318 |
| 9.3.1 | Cleaning | g a ganat; hierarchy, heterogeneity and benefits | 320 |
| 9.3.2 | Initiator | s. leaders and mediation | 324 |
| 9.3.3 | Exit-opt | ions | 326 |
| 9.3.4 | Commu | nication, perception and the use of video in participatory | |
| 51011 | develop | ment | 326 |
| 035 | Collectio | we action in a Middle Eastern context: <i>shirkah dirkah</i> and | 520 |
| 1.5.5 | concert | ve action in a whether Eastern context. Smiken unken and | 227 |
| 9.3.6 | Final the | oughts and reflections on further research | 329 |
| 2.010 | 1 | | 022 |
| 9.4 Co | nclusion | | 330 |
| APPENDI | X 1 | MAPS | 336 |
| APPENDI | X 2 | MARRIAGE ALLIANCES SHALLALAH SAGHIR | RAH 342 |
| APPENDI | X 3 | GENERAL SITE INFORMATION OF SYRIAN QANATS | 344 |
| REFEREN | NCES | | 348 |
| SUMMAR | RY | | 373 |
| SAMENV | ATTING | | 377 |

| igure 1 - Schematic picture of a qanat system (adapted from Lightfoot, 1996) | 2 |
|--|-----|
| igure 2 - Partial representation of a qanat as human-ecosystem | 4 |
| igure 3 - Qanats as human ecosystems in a scaled hierarchy | 4 |
| igure 4 - Power and relations in a development process | 5 |
| igure 5 - Alternative value orientation (adapted from Uphoff, 1996) | 6 |
| igure 6 - Problem analysis of Qanat abandonment in Syria | 7 |
| igure 7 - Relation status quo and last year of cleaning | 9 |
| igure 8 - The village of Shallalah Saghirah | 10 |
| igure 9 - Entrance to Shallalah Saghirah | 11 |
| igure 10 - Typical lay-out of a dwelling in Shallalah Saghirah | 11 |
| igure 11 - Rainfall Shallalah Saghirah in the year 2000 | 11 |
| igure 12 - Oillamp found in qanat Shallalah Saghirah | 114 |
| igure 13 - Cross-section Oanat Shallalah Saghirah | 11 |
| igure 14 - Groundwater levels of tube wells | 124 |
| igure 15 - Sheenshearing is one of the main income sources | 13 |
| igure 16 - Irrigation schedule individually kept by a member of the haquun | 13 |
| igure 17 - "Illegal" irrigation of a homegarden nlot | 14 |
| igure 18 - Social talk at the outlet | 14 |
| igure 19 - Aerial nicture of HH5, the dwelling owned by HH23 | 14 |
| igure 20 Filling up a gaduz near the birkeb | 14 |
| igure 21 Irrigating the buston at sunset | 14 |
| igure 22 - Unhoff's Orientation to Action Grid (Unhoff 1006) | 14 |
| igure 22 - Ophoni s Orientation-to-Action Ond (Ophon, 1990) | 13 |
| igure 23 - Main actors of the renovation of Shahalan Sagniran | 10 |
| igure 24 - Focus groupineeting with the Haquun on 1st December 1999 | 10 |
| igure 25 - Cleaning of the birken, spring 2000 | 17 |
| igure 26 - Orientation to Action during renovation (May/June 2000) | 1/ |
| igure 27 - Shifts in orientation to action (June 2000) | 18 |
| igure 28 - Shifts in orientation to action (July 2000) | 18 |
| igure 29 - Shifts in orientation to action (August 2000) | 18 |
| igure 30 - Shifts in orientation-to-action (September 2000) | 19 |
| igure 31 - Final airshaft renovated after the last day of the renovation | 19 |
| igure 32 - Member of a donor delegation prepares to descent | 19 |
| igure 33 - Discharge of the qanat in Shallalah Saghirah after rainshowers | 21 |
| igure 34 - Annual discharge of the qanat in Shallalah Saghirah | 21 |
| igure 35 - Birkeh filled completely, December 2000 | 21 |
| igure 36 - The renovated Monastery of Mar Yaqub, Qarah | 22 |
| igure 37 - Typical masonry Qarah qanats | 22 |
| igure 38 - Discharge 'Ayn al Qraizah (1992-2001) | 22 |
| igure 39 - Discharge of 'Ayn al Baydah (1992-2001) | 22 |
| igure 40 - Discharge of 'Ayn al Taybeh (1992-2001) | 22 |
| igure 41 - Irrigation reservoir 'Ayn al Taybeh January 2001 (mid-day) | 23 |
| igure 42 - Irrigation reservoir 'Ayn al Taybeh November 2002 (mid-day) | 23 |
| igure 43 - Sources section Taybeh 3 | 23 |
| igure 44 - Collapsed motherwell of Taybeh 3 filled with debris | 23 |
| | 24 |
| igure 45 - Entrance shaft Tayben 3, moisture and debris visible in canal | |

| Figure 47 - Cross-section Taybeh 1 and 2 | 244 |
|--|-----|
| Figure 48 - Cross-section Taybeh 3 | 245 |
| Figure 49 - Income sources users community Qarah | 249 |
| Figure 50 - Investment attitudes Qarah users community | 255 |
| Figure 51 - Suggestions for improvements from Qarah community | 257 |
| Figure 52 - Main actors Qarah renovation | 266 |
| Figure 53 - Supervisor from Maaloula checks collapsed | 278 |
| Figure 54 - Qanat experts at work in Taybeh renovation | 279 |
| Figure 55 - Nun from monastry inspecting the work | 281 |
| Figure 56 - Representation of qanat community as a consumer unit | 298 |
| Figure 57 - Symbols used in representation of human ecosystem | 298 |
| Figure 58 - Partial representation of a qanat as human ecosystem | 299 |
| Figure 59 - Qanat users | 304 |
| Figure 60 - Borehole users | 304 |
| Figure 61 - Partial representation of a qanat human ecosystem | 305 |
| Figure 62 - Marriage alliance between Bayt Hatim and the Hariri clan | 342 |
| Figure 63 - Marriage alliance between Bayt Hamzah and Bayt Amir | 342 |
| Figure 64 - Badileh marriage between Hatim and Amir lineages | 343 |

List of tables

| 65 |
|-----|
| 97 |
| 98 |
| 101 |
| 105 |
| 121 |
| 122 |
| 127 |
| 131 |
| 137 |
| 138 |
| 140 |
| 141 |
| 146 |
| 216 |
| 224 |
| 224 |
| 235 |
| 246 |
| 246 |
| 247 |
| 250 |
| 252 |
| 290 |
| 309 |
| |

| List of maps | |
|--|-----|
| Map 1 - Detailed map of the qanat in Shallalah Saghirah | 117 |
| Map 2 - Detailed map of the qanat 'Ayn al Taybeh | 241 |
| Map 3 - Distribution of qanats in Syria | 336 |
| Map 4 - The qanat site of Shallalah Saghirah | 337 |
| Map 5 - Aerial Photo the Khanasser Valley, 1958 no: P327Sa | 338 |
| Map 6 - Location Byzantine sites near Shallalah Saghirah | 339 |
| Map 7 - The Qanat site of Qarah | 340 |
| Map 8 - Groundwater levels around Qarah qanats | 341 |

Glossary of Local Terms¹

| Deabain juage |
|---|
| Mumps (disease) |
| Length of rotation (in days) of specific turns in irrigation water right |
| The followers of a specific Bedouin tribe. Those who pay protection tax. |
| Similar to Al Atba, also translated as "the attached". These people are in some way attached to a particular Bedouin tribe and pay protection tax |
| Seasonal workers |
| Source |
| Revival (from Ba'ta: to send, evoke or awaken). The name of the main political party in Syria |
| Exchange marriage, usually between parallel cousins |
| House or lineage of a particular family |
| Mobile vendor in rural areas |
| Without payment (working for free) |
| Female parallel cousin |
| Reservoir |
| |

¹ These are local terms as opposed to Arabic terms. Some of these terms are not literally Arabic but could be of Turkish or Persian origin. All these terms are used locally at the research sites.

| Caliph | Islamic leader, usually claimed to be a successor of Muhammad. |
|--------------|---|
| Dunum | Area measurement commonly used in the Middle East. One dunum is 1000 m2 |
| Dor | Rightful turn in irrigation rotation |
| Hakkih Fadih | Empty talk (<i>lit</i>) "hot air" |
| Haquun | Owners of the irrigation rights |
| Harim | A defined boundary around the qanat tunnel, source area or outlet in which it is forbidden to drill wells or dig another qanat |
| Hosh | House or lineage |
| Ibrik | Small plastic water bucket |
| Jiil | Members of the same age group |
| Jub | (Water) Well or airshaft |
| Khayr | Good or The Good |
| Kubbeh | Name of a typical conical shaped dome roof of a traditional mudbrick house in northern Syria |
| Madafa | Guest room used as a meeting place to invite important guests and for achieving greater consensus for political and social domination |
| Mafraq | Crossing between two transects, such as tunnels, roads or lines |
| Mai | Water |
| Mukhtaar | The chosen leader, usually referred to as the head of the village community |
| Muwaddafiin | Government employees |

| Natur | Guard, someone who oversees |
|-------------------|---|
| Nebe' | Source |
| Oda | Place for gathering and prestige, similar to <i>Madafa</i> |
| Qaduz | Large metal bucket container usually carried on the head |
| Qanat (Romani) | Traditional water tunnels in Syria |
| Ras | Head |
| Saqiyeh | Open channel |
| Sarab | Course or flow |
| Semna 'Arabi | Sheep butter or fat |
| Sharaf | Honour |
| Shaykh | Leader |
| Showkah | Thorn |
| Shu bi'ulu an-nas | What the people say (lit.) |
| Sunduq | Box or kitty |
| Sunduqiye | Boxed, type of tunnel construction used in qanat renovation |
| Tanour | Bread oven |
| Wadi | Valley |
| Wasta | Mediator or mediation |
| Wasta Qawiyye | Grand mediation |
| Za'ater | Thyme powder or paste, commonly used for breakfast |