

# Power and Interests in Conflicts over the Use of Irrigation Channels in an Informal Settlement- a Peruvian Perspective

*Lisa Waselikowski*



# Power and Interests in Conflicts over the Use of Irrigation Channels in an Informal Settlement- a Peruvian Perspective

*Lisa Waselikowski*

**Supervisor:** Nadarajah Sriskandarajah, SLU,  
Department of Urban and Rural Development  
**Assistant Supervisor:** Thorsten Treue, University of Copenhagen,  
Department of Food and Resource Economics  
**Examiner:** Hans Peter Hansen, SLU,  
Department of Urban and Rural Development

**Credits:** 30 HEC  
**Level:** Second cycle, A2E  
**Course title:** Independent project in Environmental Science - Master's thesis  
**Course code:** EX0431  
**Programme/education:** EnvEuro – European Master in Environmental Science

**Place of publication:** Uppsala, Sweden  
**Year of publication:** 2013  
**Cover picture:** Lisa Waselikowski  
**Maps and/ or images:** figures published with permission from copyright holders  
**Online publication:** <http://stud.epsilon.slu.se>

**Keywords:** Unplanned Urbanisation, Open-access Resources, Soft Systems Methodology, Informality in Housing, Power in Conflicts

**Sveriges lantbruksuniversitet**  
**Swedish University of Agricultural Sciences**

Faculty of Natural Resources and Agricultural Sciences  
Department of Urban and Rural Development

## **Abstract**

Rapid and informal urbanisation is a phenomenon which is changing agricultural and natural landscapes into urban areas in an unplanned manner all over the world, especially in the global south. This has many consequences one of which is tension and conflict between traditional land users and urban settlers, leading to struggles over scarce resources.

This study analysed the underlying dynamics of conflicts associated with the use of agricultural irrigation channels in what has become an informal settlement in Lima, Perú. Based on the perceptions of involved stakeholders, the Soft Systems Methodology was used for obtaining a holistic understanding of the situation. Limitations for improving the situation were identified and propositions for possible change were developed.

The findings suggest that the conflicts about the collective use of the irrigation channels are strongly shaped by differing interests of the stakeholders and by unequal power structures. Embedded are the conflicts into a complex network of institutional, social and environmental factors, whereby institutional and social factors dominate. The study supported stakeholders in defining limitations to improvement. These are marginalisation and social exclusion of the people living in the informal settlement by public stakeholders, a lack of governmental enforcement concerning informal development and a lack of public accountability. Concerning possible improvements the study has found that positive changes to the present situation can be initiated, by empowering the citizens of the informal settlement and by continuously fostering dialogue and exchange of information between the different stakeholders.

**Keywords:** unplanned urbanisation, open-access resources, soft systems methodology, informality in housing, power in conflicts.

# Table of Contents

1. Introduction.....	9
1.1 Country Background Information .....	9
1.2 Problem Statement .....	13
1.2.1 Objectives .....	13
1.2.2 Research Questions .....	14
1.3 Research Approach .....	14
2. Theoretical Framework .....	16
2.1 Systems Thinking.....	16
2.2 Informal urbanisation .....	18
2.3 Common- pool resources .....	20
3. Material and Methods .....	22
3.1 Literature Review.....	22
3.2 Description of the study area .....	22
3.3 Stakeholder Selection and Data Collection.....	25
3.4. The Soft Systems Methodology .....	27
3.5 Limitations to the study.....	30
4. Results and Discussion.....	31
4.1 Historic context .....	31
4.2 Description of stakeholders.....	32
4.3 Rich Picture- the conflict situation expressed and unstructured .....	34
4.4 Power relations and underlying power structures .....	37
4.5 Areas of concern.....	41
4.6 Limitations to improvement.....	42
4.6.1 Direct Limitations .....	43
4.6.2 Indirect Limitations.....	44
4.7 Open-access-status of irrigation channels.....	45
4.8 The ideal situation in a soft systems thinking world.....	46

5. General Discussion .....	48
5.1 Social components of the conflict .....	48
5.2 Environmental components of the conflict .....	50
5.3 Institutional components of the conflict.....	50
5.4 The rules of the game- power and interest in informal urbanisation in Chuquitanta.....	53
6. Conclusion .....	55
References .....	56
Appendix .....	63

## **Acknowledgements**

First of all, I would like to thank the members of the community of Chuquitanta for participating in my research and for openly sharing their perspectives and concerns with me. Without them it would not have been possible to conduct my thesis.

I would also like to thank the members of the LiWa team, especially Christian D. León and Manfred Schütze for supporting and supervising me during my time in Lima.

Further thanks to my supervisors Nandarajah Sriskandarajah and Thorsten Treue for fruitful discussions about my thesis and for their input during the process of writing.

Most of all I would like to thank my family for always supporting me and for enabling me to live and study abroad. Special thanks to my parents Karin and Günther Waselikowski, without their love and constant encouragement I would have never been able to come that far. Thank you so much!

## **List of Abbreviations**

COFOPRI	Organismo de formalizacion de la propiedad informal- Commission for the official registration of informal property
SUNARP	Superintendencia Nacional de los Registros Públicos
SSM	Soft Systems Methodology
LiWa	Lima Water Project
ALA	Administracion Local de Agua- Local Department for Water

## **List of Figures**

Figure 1: Expansion of Lima and courses of Chillón, Rimarc and Yurin

Figure 2: Location of San Martin de Porres

Figure 3: Location and course of irrigation channels in Chuquitanta

Figure 4: The current state of the irrigation channel "Canal Central"

Figure 5: The Soft Systems Methodology

Figure 6: Time Line of important events on a local and country-wide level

Figure 7: Rich Picture 1

Figure 8: Rich Picture 2

Figure 9: Venn-Diagram

Figure 10: Importance-Influence Diagram



# 1. Introduction

Rapid urbanisation is a well-known and well-discussed global phenomenon which is leading to the transformation of landscapes and traditional land use patterns all over the world. The global share of people living in cities has been rising for decades; in 2012 around 51% of the world population has been living in urban regions (DSW, 2012). Especially in the global south urban centres have been growing rapidly and to a considerably extent, resulting into a major demographic shift from predominantly rural to urban societies. The process of urbanization has been happening to a large extent through informal ways of accessing land and housing (Van Gelder, 2013), resulting into an accelerated growth of informal settlements and slums in the fringes of urban centres, primarily in low income countries (UN Habitat, 2011). It was estimated by the United Nations Human Settlements Programme, that in 2000 around 900 million people lived in informal settlements and that this number will increase up to 1.4 billion by 2050 (UN Habitat, 2010).

The swelling urban centres have been leading to considerable land cover and land use changes in adjacent areas, as urban infrastructure displaces formerly present types of land, like natural or arable areas (Alphan, 2003). As a result of the unplanned process, conflicts over resource use can occur between traditional inhabitants and new comers, as it is the case in Lima, Perú.

Lima the capital of Perú, with a population of around 8 million inhabitants is a rapidly grown city, where wide urban and semi-urban areas are covered with informal settlements. The resulting unplanned land use change in and around Lima is in some areas happening at the cost of traditional land use. Tensions and conflicts are created between the new and the traditional land use systems, caused by overuse of and differing interests in open-access resources.

## 1.1 Country Background Information

The study was conducted in a northern district of Lima. The following chapters will introduce the study area and its political-economic context.

### *Introduction to Lima*

Lima is the capital and by far largest city of Peru. With more than 8 million inhabitants, Lima hosts around one quarter of the total Peruvian population (UN, 2013). The city is located in the central coastal plain of Perú, within the river valleys of Rimarc, Chillón and Yurin. Its north-south expansion is about 60km, in the eastern part informal settlements, called "asentamientos humanos" (human settlements) spread out from the city centre into the surrounding hills (Vigo, 2013). Central

Lima and the suburbs form together the Metropolitan area of Lima which is divided into 43 districts, each district with its own mayor and municipality. Besides being the capital, Lima is the financial, industrial and political centre of Perú; all governmental ministries and governmental branches are based in central Lima (UN, 2013).

As Lima is located in a desert zone, its climate is dry, with an average annual rainfall around 9mm (Saucedo, 2008). Only two percent of the water resources in Perú can be found in the coastal area, making water a scarce resource in Lima. The water supply of Lima is highly depending on the river Rimarc which is having its spring high up in the Andes, as it is the biggest of the three rivers leading into Lima. Due to an incremental growth in inhabitants and due to lacking capacity of the water management company (SEDAPAL) to cope with the increased demand for fresh water and also sewage treatment, currently around 1 million inhabitants of Lima are not receiving fresh water from the public water network (World Bank, 2013) and also only around 85% of the inhabitants are connected to the sewage collection network (INEI, 2007). In *Figure 1* the expansion of "Lima Metropolitana" and the courses of the three rivers Chillón, Rimarc and Yurin are depicted.



*Figure 1-Expansion of Lima and courses of Chillón, Rimarc and Yurin. (Source: McElhinney, 2012).*

#### *Economic-political context*

Perú is a democratic republic, accustomed to an unstable development of its economic power. Since

the mid-nineties, after a period of political and economic crisis in the 80s, the economic situation throughout whole Perú started to stabilize (Chion, 2002). The GNI per capita, indicating the average income per citizen (World Bank, 2013) has been growing since the beginning of the 1990s, as the political situation stabilized under President Fujimori. He initiated an economic and state reform, during which the Peruvian economic market opened for international investments and investments in public infrastructure were made (Chion, 2002). In the same figure a growth in life expectancy and education and in general the growth of the Human Development Index since beginning of the 1980s is depicted. In 2012, according to the World Bank (2013) the income level in Perú is “Upper Middle Income (\$4,086 - \$12,615)”, with a GDP growth of 6% in 2012. On the other hand, still nowadays social and regional inequalities persist (BMZ, 2013). In 2010 around 31% of Peruvian lived in “moderate poverty” (SEDLAC, 2013), meaning that the “income barely (is) sufficient to meet a family’s minimum needs for food, clothing, shelter and health care“(World Bank, 2013). Poverty rates in rural areas, like the Andean Highlands and the Amazonas Basin are higher than in urban areas (SEDLAC, 2013), as these remote areas are not well connected to the industrial coastal area (BMZ, 2013). Therefore until today the economic growth in Perú is unequally distributed and not accessible for everyone.

### *Informal settlements in Lima*

Lima is a city with a long tradition of informality in housing. Not only single houses and dwellings have been constructed informally, but whole districts in Lima have grown in an informal way during the last centuries. Especially from the beginning of the 1940s an immense increase in migration from all over the country towards Lima could be observed (De Soto, 1986). There are various reasons for this major process of informal urbanisation. Due to decreased mortality rates the Peruvian population started to grow in an accelerated pace from the beginning of the 1940s (INEI, 2012), whereas employment opportunities in rural areas stagnated (Gaigl, 1982). Improved connections between different areas and cities through construction of infrastructure have been another push factor for many Peruvians out of remote areas into coastal cities, especially into Lima (De Soto, 1986). Pull factors towards Lima are better educational possibilities, the presence of a health care infrastructure and employment possibilities (Gaigl, 1982).

In the 1980s, around 42% of the total dwellings in Lima were informal, 49% were formal housing and 8.2 % were degenerated dwellings in formal districts (De Soto, 1986). Nowadays especially the marginal rural areas of Lima are shaped and dominated by informal housing, whereas central districts accommodate the formal dwellings of the more wealthy population (Mertins, 2009).

### *Formalization of land*

Formalization of property rights generally is understood as the legal recognition of a person's rights to property (Lastarilla-Cornhiel, 1999).

The Peruvian government changed its approach of dealing with informal housing many times throughout the last centuries, as informal housing has always been a double-edged sword for Peruvian politicians. On the one hand providing appropriate housing for the Peruvian population seemed to be an unsolvable problem for most of the Peruvian governments, on the other hand many politicians and governments came to agreements with informal settlers in order to receive their political support (Peattle, 1990). In the following an overview of the historic development of formalization of land in Peru from the past until now will be given.

Before the 60s the political responses to informal housing were either characterized by a laissez-faire attitude or by selectively evicting informal developed neighbourhoods (Calderon, 2003). From the 60s onwards a change in the political management of informality in housing took place. Laws for improving and legalizing informal settlements were established by the Peruvian governments. In 1968, Juan Velasco Alvarado, the Peruvian president back then (1968–1975) founded the “National Organization for the Development of Young Towns”, representing informal settlers and therefore giving them a more official status (Peattle, 1990). Also in 1968 the Peruvian government changed existing decrees by eliminating the requirement to install services before obtaining land titles (Cockburn, 2000).

In the 90s the Peruvian government under Fujimori started in cooperation with the World Bank the project “Perú: Property Rights”, in order to develop a new tenure system (Zanelli, 2013). As part of the project in 1996 a single national titling authority (COFOPRI) was created (World Bank, 1998). The whole project was supposed to facilitate the registration of property for low-income groups and subsequently improve their economic status.

Since 2001 the Peruvian government has been changing its approach in managing informality in housing, by improving the supply of housing for middle- and low income groups. Therefore, the government acknowledged insufficient provision of housing for the poor as one of the factors for informality in housing. The housing policy established in 2001 which is still in place today, involves private construction companies for producing adequate and affordable housing and also involves private financial institutions for financing loans (Fernández-Maldonado, 2010). Thus, since more than a decade, the Peruvian government has been providing housing through the social housing sector. Nevertheless factors like insufficient monitoring of housing processes by public staff and lack of financial resources of the social housing sector are limiting the success of the policy (Fernandez-Maldonado, 2010).

### *Legal process of formalization*

In order to receive a land title for property that was inhabited informally, landowners first have to apply for their registration at COFOPRI (COFOPRI, 2013). Within COFOPRI the property is registered in the “Registry of Immovable Property” (Registro de Propiedad Inmueble). After being registered in COFOPRI, landowners have to register at SUNARP, the governmental controlling authority. Required for becoming registered is the proof of having voted in the last elections (SUNARP, 2013). Being registered in SUNARP, a property owner receives a land title.

## **1.2 Problem Statement**

The struggle over the use of water as an “open access resource” is a present issue in Chuquitanta, an informally grown settlement in Lima. The struggle is expressed by conflicts arising around the collective use of open irrigation channels between different user groups which can be mainly categorized into farmers and residents. Due to persistent streams of rural Peruvians to Lima, the area has been undergoing a landscape and land use change, leading to the replacement of agricultural cultivated fields through unplanned settlements. The irrigation channels, traditionally used for irrigation purposes by farmers are now used by multiple stakeholders for various intentions. Current conflicting uses of the channels are waste dumping and sewage by the residents and irrigation of fields by the farmers. Due to the subsequent contamination of the water the remaining active farmers in the area are left with reduced income possibilities. The conflict situation is further affected by unclear user rights of the irrigation channels and a lack of intervention and control by public authorities. The problematic situation is complex due to legal, institutional, environmental and social factors and it is shaped by differing interests and activities of the involved and affected parties.

Due to the contamination of the irrigation channels the livelihoods of the farmers are threatened and the quality of life for the residents of the area is diminished. Thus it is evident that the current situation is negatively affecting the lives of both the residents and farmers and therefore action for change is required. In order to analyse the conflict situation and to develop propositions for possible improvements, it is proposed to obtain an understanding of the different perspectives of the involved stakeholders and to identify major limitations for improving the situation. Furthermore an analysis of the discovered limitations within relevant theoretical frameworks is seen as necessary for obtaining an understanding of underlying dynamics of the conflicts.

### **1.2.1 Objectives**

The following objectives are guiding the investigations of this study:

- obtaining an understanding of the conflict situation in Chuquitanta
- identifying limiting factors for a collective use of irrigation channels in Chuquitanta
- discussing identified limitations within their theoretical framework
- developing and proposing improvements to the situation

### 1.2.2 Research Questions

#### *Main research Question*

What are limiting factors for the collective use of irrigation channels in the informally urbanized area Chuquitanta and what are possible improvements to the situation?

#### *Minor research Questions*

- How do relevant stakeholders perceive the situation in Chuquitanta?
- Which are the main issues of concern in relation to a collective use of irrigation channels in Chuquitanta?
- How and to what extent can the situation be improved by following the Soft Systems Methodology?

## 1.3 Research Approach

The methodology chosen to analyse the situation in Chuquitanta and, if possible, to bring about change is the Soft Systems Methodology (SSM) developed by Peter Checkland and his colleagues. The SSM is considered as a relevant methodology for dealing with the given problematic situation in Chuquitanta, as it has already proven in many cases before to be a valid analytical tool for complex and messy situations, involving human activities connected to natural resources (Bunch, 2007). According to Checkland (2006) the SSM can be used for problematical and complex situations involving human activities, where at least one person thinks that “something should be done about this”.

Next to the SSM an in-depth literature review on relevant scientific papers, statistics, maps and articles will be conducted in order to put the conflict situation in Chuquitanta into its greater social, cultural, political and historical context.

#### *Report Structure*

The thesis structure is outlined as follows. At first the theoretical framework will be elaborated in chapter 2. As a next step in chapter 3 the background of the study, the application of the SSM and the data collection will be described. Afterwards the results of the intervention will be presented and

discussed in chapter 4, followed by a general discussion (chapter 5) of the identified limitations and finally conclusions and perspectives in chapter 6.

## 2. Theoretical Framework

### 2.1 Systems Thinking

#### *From Reductionism to Systems Thinking*

“Systems thinking” is a relatively new scientific movement, as the term “systems thinking” and the idea of a holistic systems approach to deal with irreducible complexity in real world situations was institutionalized only in the middle of the last century (Checkland, 2000). The systems approach has been described by Checkland (1984) as a counteraction to reductionism and mechanistic thinking prevailing in natural science. It came up as a new scientific paradigm due to the inability of reductionism to address complexity in the real world sufficiently. The core of soft systems thinking is explained by Checkland (1984) as two pairs of ideas: emergence and hierarchy, communication and control. These ideas will be explained in more detail below.

Within reductionism it is believed that everything can be analysed and understood in an objective and mechanistic way, because everything, including humans, organisations and society, can be seen as “living machines” which equal the sum of their parts (Midgley, 2000). Thus reductionism seeks to understand complex phenomena by analysing their different components. In contradiction to that, systems thinking works with the concept of emergent properties, meaning that ‘The whole is greater than the sum of its parts’ (Flood, 2010), due to the interrelations between the single entities (Wilson and Morren, 1990). Therefore interconnection of the different parts and their interactions are crucial factors in understanding phenomena and their complexity (Kogetsidis, 2012). Concerning the structure of complexity, in systems thinking it is assumed that complexity is hierarchical, built of different levels, each level more complex than the former. Within systems these levels are sub systems, residing next to each other. Interactions between the different levels and components within a system and also the relation between an open system and its environment are regulated through communication and control processes (Checkland, 1984). Communication is about transforming information; control processes comprise elements like feedback mechanisms, self-regulation and adaptation (Wilson and Morren, 1990).

In the course of the systems thinking movement, various branches of systems thinking have been developed, some of them are based on mechanistic assumptions, others follow a more soft approach (Midgley 2000). Flood (2000) divides the different branches of systems thinking into two major sections: *Systems thinking* presumes the existence of systems in the real world, whereas *systemic thinking* rejects this notion. In the following the development of soft systems thinking which is part of systemic thinking, will be elaborated in more detail, as the ideas of this branch are the basis for the soft systems methodology applied in this study.



### *Systems Thinking applied*

Peter Checkland and colleagues started to develop systems thinking approaches for managing real life problem situations at the Lancaster University in the mid-1960s. In the beginning they applied systems thinking, for example in organisational analysis, for the technical purpose of engineering existing organisations in regard to their inherent systems and subsystems (Checkland, 2000). The predominant notion of Peter Checkland and his colleagues at this time was that the world would contain systems and subsystems. As over the years the systems approach was practiced in real world projects, a different way of perceiving the appearance of systems in the real world started to emerge. Within this new school of thought, Checkland (2000) proposed that real world situations could not be seen any longer as systems themselves, but as human situations, driven by purposeful human activities, which could be modelled as “human activity systems”. Therefore systems were not seen any longer as something existing in reality, but rather as a tool to understand complexity within the world (Checkland, 2000). This new school of thought is “soft systems thinking”, in comparison to “hard systems thinking”.

### *Soft Systems Thinking*

Soft systems thinking is a branch of systemic thinking in which social reality is understood as the construction of humans, based on personal interpretations of their experiences (Flood, 2000). It acknowledges the subjectivity of how humans perceive reality and how knowledge is created. Soft systems thinking rejects the notion that objective knowledge of the world can be built and that human’s knowledge of the world reflects the actual reality (Midgley, 2000). Based on the subjectivity of knowledge creation and perception of reality, soft systems thinking supposes that there are various realities rather than one reality. According to Wilson and Morren (1990), every person holds a distinct and individual mental framework, the so called world view, deriving from personal experiences and shaped by emotions, beliefs, morals, personality and storage of knowledge. The world view of a person strongly influences the way occurrences are perceived and interpreted and also what kind of observations are made, as it frames the view on the world around. Such as a person’s perception of the world is shaped by a distinct world view, so are the ways of acting and behaving in the world (Wilson and Morren, 1990).

On the basis of these assumptions, Peter Checkland and his colleagues developed the soft systems methodology for dealing with complex and messy situations, comprising human activities. The content and tools of the soft systems methodology will be explained in more detail in chapter 3.4 *Soft Systems Methodology*.

### *Interrelations between problems*

Based on the ideas behind systems thinking, the interconnectedness of phenomena and the interrelations between different problems are characteristics of the complex and messy nature of the world. A real-life problem does not occur in isolation and by itself (Ison et al, 1996). Examples for interrelated issues can be found on a global, but also on a local level. Often global environmental issues are characterized by complexity, involving interconnected ecological, social and political problems. Local issues often arise of differing perspective of the involved stakeholders and their interconnected individual problems, leading to larger problematic situations (Midgley, 2000).

## **2.2 Informal urbanisation**

### *Definition of Informal Housing*

Informality in housing exists in several forms and various definitions and theories have been constructed by institutions, researchers and urban planners in order to capture its multidimensionality. The definition of informal housing by the UN Habitat Programme comprises two different types. Firstly “areas where groups of housing units have been constructed on land that the occupants have no legal claim to, or occupy illegally” (UN, 1997) are defined as informal housing. The second type is defined as “unplanned settlements and areas where housing is not in compliance with current planning and building regulations (unauthorized housing)” (UN, 1997).

According to De Soto (1986) there are two ways of informally acquire property for building homes. Either property can be taken through invasion of a certain area, or it can be bought and sold by the means of an informal market. In many cases in Latin America associations and cooperatives are trading agricultural land through unwarranted subdivision of land (Fernandes, 2011). Moreover, property which is lacking basic services like water and sewage systems is classified as informally accessed and occupied urban land (Smolka & Biderman, 2011).

Informality in housing has been extensively discussed across different scientific disciplines, examining it from different angles and theoretical frameworks. In contrast to De Soto, whose ideas of informality are based on a strict separation of informal properties from formal ones, Glenn (2008) suggests to rather perceive informality and formality as concepts which exist in reality in mixed forms, depending on the degree of compliance with both public and private law. McFarlane (2012) on the other hand elaborates on informality and formality as practices, rather than a given, legal status in a certain geographical area. Therefore McFarlane breaks with the common ideas of informality as a characteristic of the urban poor and the geographical division of informal and formal settlements, alluding on their interconnectedness in time and space.

### *Process of informal housing*

De Soto (1986) describes the process of informal housing as completely reverse to traditional urbanisation, because it starts with occupying the site, then dwellings are constructed, followed by a gradually provision of public services and only in the end the property of the site is obtained. A common factor of most of the informal settlements is their gradual development from dwellings built with low-cost materials, like cardboard to houses constructed out of more permanent material (Van Gelder, 2013). In many cases at the beginning of informal settlements, public services like electricity, water, pavement and sanitation are not provided. As over time the houses are getting more permanent, progressively the supply of public services is established (Fernandes, 2011).

### *Driving factors*

Before the 1990s informality in housing has been seen as a direct consequence of poverty (World Bank, 2006). Over time this perception started to change, as during the 90s in many cities in the global south poverty decreased, but informality on the other hand increased (Smolka & Biderman, 2011). It became obvious that poor areas are not only based on informal housing and even in wealthier areas informal housing occurs. Therefore the direct link between poverty and informality has been cut, opening the way for a more holistic perception of the concept of informality, acknowledging its multidimensionality.

In current literature the driving factors for informality in housing have been discussed extensively. Governments failing to provide basic needs like access to adequate housing for social classes with low-income is seen by van Gelder (2013) as one of the main reasons for informal housing. Access of the poor to formal housing possibilities often is restricted, due to costly and inconvenient registration processes and obsolete and unrealistic land use legislations. Moreover unrealistic urban planning and a defective legal system are driving factors for urban informality, based on governmental misconduct (Fernandes, 2011).

Interest-driven reasons for the development and maintenance of informal areas are based on the favourable conditions that informal areas can pose for different parties. Informal settlements are in a state of “being caught in the middle”, between being included and excluded from society, government and economy. For example the partial inclusion to formal economy can produce advantages for the local economy; the exclusion from complete formalization can serve political purposes (Yiftachel, 2009). Therefore the maintenance of these informal zones can be an aspiration by various actors, seeking to take advantage of their “gray” legal status.

### *Economic factors*

Looking from an economic perspective at informality of housing, questions about the costs and

benefits arise and about the main beneficiaries and losers of this phenomena. One might think that the urban poor are benefiting the most of informal urban development, as it facilitates access to land. Smolka & Biderman (2011) elaborated more on this issue, their findings suggesting a different conclusion. Firstly the location costs in informal settlements often exceed the costs in formal settlements, as informal buyers might pay a higher prize for a smaller than minimum lot, a lot which then often comes without or only partially provided public services, resulting into even higher costs. Additionally to a lack of public services the residents are affected by insecurity concerning land tenure, discrimination and environmental and health risks. Also for local governments costs of informality in housing occur, as they face direct costs in terms of upgrading programmes and indirect cost when dealing with consequences of informal housing, like social problems and public health (Fernandes, 2011).

## 2.3 Common- pool resources

### *Definition of common- pool resources*

Common- pool resources are resources, where the definition of recognized users and exclusion of other users is difficult, due to various factors like costs for fencing the resource or costs of enforcing property rights (Ostrom and Gardner, 1993). The yield of the resource is subtractible, as due to the limited supply of the resources, the use of one unit of the resource by any person reduces the benefits for the other users (Gardner et al., 1990). Typical common pool resources are forests and fisheries, but also infrastructures like irrigation systems. Common pool resources can be further categorized into open-access resources, when they are accessible to everyone (Ostrom, 2008). An underlying presumption of the joint use of open access resources is that individuals are prone to use more of the resource or to invest less in it, than is optimal for all the users (Gardner et al., 1990).

### *Managing common- pool resources*

Experiences of the last decades have shown that there is no universal remedy for problems concerning common pool resources. As the interactions between humans and ecosystems are complex, diverse and uncertain the management of these interactions needs to be based on exact information and policies have to be adapted to their particular context. Furthermore local cultures and institutions have to be included into policy making processes (Ostrom, 2008). Ostrom also (2008) suggests the updating of relevant data about ecosystems connected with human systems and the integration of local knowledge and perceptions as crucial for managing common pool resources. Dietz et al. (2003) defined conditions for effective governance of common pool resources:

- Monitoring of the resource and its use is possible, the information easy accessible and

understandable

- Rates of change of resource use, the number of users, technology and economic and social conditions are moderate
- Frequent face-to-face communication between user-community exists
- Exclusion of external users is possible at low cost
- Rule enforcement and monitoring is supported actively by the users

In reality these conditions rarely can be found in real life situations, but Dietz et al. (2003) suggest that they can be seen as guidelines for generating effective institutional arrangements or to manage to govern common pool resources without these ideal conditions present.

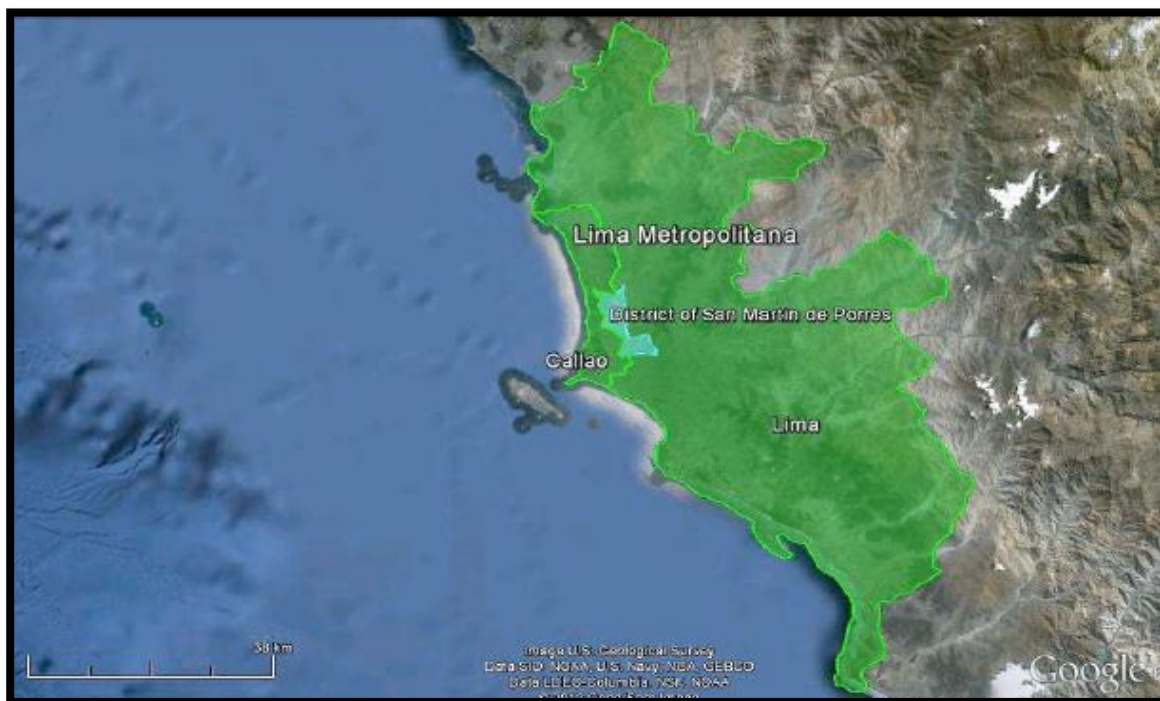
## 3. Material and Methods

### 3.1 Literature Review

An in-depth literature review of scientific articles, newspaper articles, books, maps, statistical data and governmental documents has been conducted, looking into the socio-economic, the political and environmental state of Peru, in order to put the analysed conflicted situation in its countrywide, historical and present context.

### 3.2 Description of the study area

The settlement of Chuquitanta, the project area is part of the municipality San Martin de Porres, a northern district of Lima. Formerly an agricultural area, now Chuquitanta is a mostly informally grown settlement, located in the northern part of San Martin de Porres, along the river Chillón. Below in *Figure 2* the location of the district of San Martin de Porres in Lima is depicted.



*Figure 2- Location of San Martin de Porres (Source: McElhinney, 2012).*

A system of irrigation channels leads through Chuquitanta. The starting point of the irrigation channels is in the eastern part of Chuquitanta, where one main channel is subtracting water from the river Chillón. From there the main channel leads into western direction, at some point splitting up into 3 different channels. The channels lead all the way through the settlement, until they reach

agricultural fields. In the figure below, the three channels (in turquoise) are depicted: the highest on the photo is Canal Jose, the second Canal Central and the lowest is Canal Josefina.

As can be seen from the aerial photo, Canal Jose is the channel that crosses the least of the urbanized area and is also supplying more agricultural fields with water, than the two other channels. Due to a higher degree of exposure to urban settlements, the channels, most affected by contamination and waste disposal are Canal Central and Canal Josefina.



*Figure 3- Location and course of irrigation channels in Chuquitanta (Leon, 2013).*

As mentioned in the Problem Statement the irrigation channels are used as waste dumps and sewage. The picture below (*Figure 4*) shows the current state of the irrigation channels, as observed in June 2013.





*Figure 4- The current state of the irrigation channel "Canal Central" (Waselikowski, 2013).*

#### *Lima Water – “LiWa”*

This thesis is written as part of an internship in the LiWa-project. LiWa is a project which is combining the work of an interdisciplinary team, containing German and Peruvian universities, Peruvian NGOs and the Peruvian water supply company SEDAPAL. Its main office is located in Lima. It has been funded by the German government for a period of 5 years. The research area of LiWa is about sustainable water and wastewater management in the metropolitan area of Lima, especially focusing on the development and application of fundamental procedures and tools for participatory decision making. The next phase of the project will be dealing with the enhancement of quality of life for the inhabitants of Chuquitanta, by building a biological waste water treatment plant, cleaning the water, making it possible to use it for the irrigation of public spaces, like parks and community gardens within Chuquitanta. As an initial step of the project in Chuquitanta the social and environmental conditions of the area will be investigated, in order to obtain an understanding of the project context and the people, who will be affected by it. This thesis is part of this initial investigation, analysing the problematic situation between the residents, the farmers and the involved institutions in order to obtain a profound understanding of their perspectives on the situation.



### 3.3 Stakeholder Selection and Data Collection

#### *Selection of Stakeholders*

Primary and secondary stakeholders were selected and contacted. Stakeholders at governmental and local level were identified. In the beginning interviews with local experts in urban planning and water governance were lead, in order to obtain an understanding of the present state in urban development and water supply and maintenance in Lima.

The stakeholders were firstly chosen through consultation with the LiWa project team. First meetings with stakeholders lead to the inclusion of further stakeholders, following the snowball technique.

#### *Data Collection*

The data collection followed a participatory approach. The methods applied were:

- *Interviews:* Semi-structured interviews with key stakeholders have been conducted. Interview questions were prepared in order to frame the interview and to facilitate a holistic and deep understanding of the perspective of the interviewed person. The Interview questions were partly based on the Wilmot Hocker Conflict Assessment Guide. This guide was developed for analysing the nature and styles of conflict, and the components of power, goals, tactics, assessment, self regulation and attempted solutions (Wilmot and Hocker, 2001).
- *Informal visits:* Chuquitanta was visited before the interviews were taking place. Due to the informal visits the area could be explored in an unbiased way.
- *Group Discussions:* A group discussion with members of the Farmers' Association of Chuquitanta was lead in their office.
- *Informal Conversations:* Throughout the whole process of data collection, informal conversations with different stakeholders took place.
- *Feedback Meetings:* After transforming obtained data into diagrams and graphs, feedback meetings were hold with the LiWa project team in order to discuss and to obtain their perspective on the situation.
- *Interactive Mapping:* As a tool for getting a better picture of the areas of conflict, during all the interviews and group discussion a map of Chuquitanta was used, were the participants could point out the areas along the channels with the most pressing problems, contamination points, and were they also could illustrate the historic development of Chuquitanta.
- *Secondary Data:* Previous research was collected, reviewed and analysed. Peruvian newspapers, articles and web pages were searched and examined, so that the local conflicts

about the use of the irrigation channels in Chuquitanta could be embedded and seen in their bigger, countrywide context.

*Table 1* below will give an overview of the methods applied, the participants involved and the achieved outcome. Additionally to the stated methods here, two workshops were planned for August 2013, in order to develop models for improvement together with the participants. Due to time and resource restrictions and a change in the LiWa-project design, these intended workshops (indicated in red) did not take place.

*Table 1- The methods applied in the study, participants and outcome.*

Method	Participants	Date	Outcome
Informal Visits	LiWA- Project team	12.04.2013	Map, first impressions
Informal Conversation	1 LiWA- Project Leader	12.04.2013	Notes, Mind Maps
	1 Public Servant of Municipality	12.04.2013	
	1 Settler (Squatter)	01.05.2013	
Semi-structured Interview	1 Expert on Urban Development	15.04.2013	Notes, Recorded Audios, Mind Maps
	1 Public Servant of ALA	05.06.2013	
	1 Employee of SEDAPAL	14.06.2013	
	1 Expert on Urban Development	22.06.2013	
	1 Public Servant, Environmental Department Municipality	20.06.2013	
Interactive Map	1 Resident	14.06.2013	Notes, Interactive Map
	1 Settler	14.06.2013	
	1 Public Servant of Municipality	14.06.2013	
Group Discussion	3 Members of farmer's association 1 Farmer	12.06.2013	Notes
Time line	1 former Farmer and resident 1 LiWa Project Team	16.06.2013	Time line on wall paper
Feedback Meeting for	1 LiWa Project Team	18.06.2013	Rich Picture extended

Rich Picture	1 Urban Architect	22.06.2013	
Workshop I	Various stakeholders	-	-
Workshop II	Various stakeholders	-	-

### 3.4. The Soft Systems Methodology

The main methodology applied in this thesis for meeting the study objectives is the Soft Systems Methodology. It was developed by Peter Checkland and others as an alternative social research approach to hard science, for dealing with problematical and complex situations that involve human activities (Checkland, 1981). Checkland (2006) defines these situations rather as “problematical” than as “problem situations”, as there might not be a single, easy to define, problem due to the complexity and messiness of real life situations. In addition to tackling real world problems the methodology can be applied for exploring social realities (Checkland, 1984). A further important aspect of the methodology is the fact that its application is not a mere observation, but a systemic intervention, where the researcher facilitates to bring about change on the basis of reflecting on given boundaries (Midgley, 2000).

The methodology comprises several steps which are forming an iterative learning cycle, starting with finding out about the situation towards defining and taking concrete actions to improve the situation (Checkland, 2006). The steps of the methodology do not have to be followed chronologically, backtracking and iterations are essential factors of the application of the methodology (Checkland, 1981). *Figure 6* gives an overview of the seven steps of the learning cycle. Below the different steps will be explained in more detail.

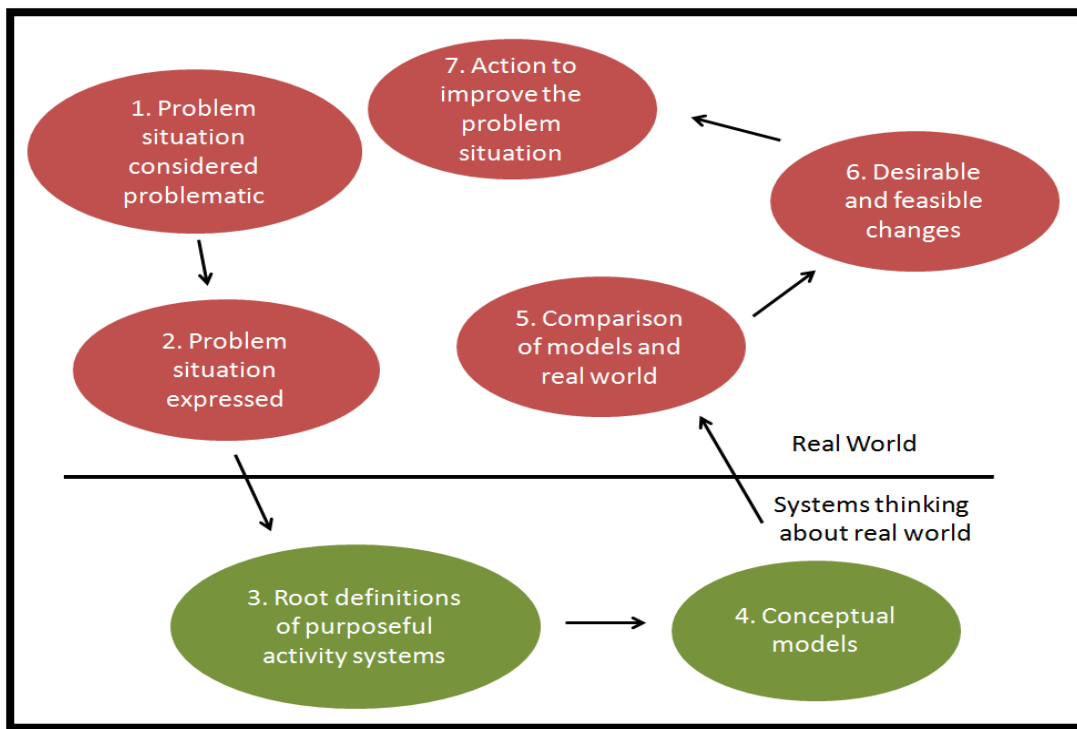


Figure 5- The Soft Systems Methodology (based on Checkland 1981)

As depicted in Figure 5, the learning cycle of the methodology comprises two kinds of activities. There are the “real world” activities which require the participation of the stakeholders for finding out about the problematic situation, desirable and feasible changes and finally to develop and implement action to improve the situation. On the other hand there are the “systems thinking” activities, where based on the “real world” experiences, relevant purposeful activity systems and subsequently conceptual models are created (Checkland, 1981).

Accompanied is the intervention by an analysis of the political and cultural and historical context of the situation, as the social context a situation is embedded in and its history are important factors in human affairs (Checkland, 2000).

#### *Understanding and expressing the situation*

The first two stages of the SSM are about getting involved into the situation, to obtain an understanding of the human activities it comprises and to express the situation in an unstructured way (Wilson and Morren, 1990). The situation is likely to be very complex, due to multiple interconnected and interacting relationships of the involved stakeholders and their differing perspectives of the situation (Checkland, 2006). In this first stage it should not be strived to reduce the complexity of the situation, rather all perspectives should be considered.

### *Rich Picture*

As part of this first intervention a Rich Picture of the situation is developed. The aim of making a Rich Picture is to depict the complexity of the situation in the richest possible way, by capturing structures and existing processes and also main viewpoints and current, identified issues (Checkland, 2006). The Rich Picture contains both hard and soft information. By hard information factual data, statistical data and quantitative data is meant. Soft information contains subjective interpretations of aspects of the situation, such as personal judgements. Producing a Rich Picture is an iterative process, and therefore the picture itself is not static, but can be changed and enhanced in further steps of the analysis (Naughton, 1984).

### *Power structures*

As part of the intervention the underlying power relations and structures of the stakeholders will be analysed. It will be elaborated on the disposition of power and how it is controlled, preserved and limited by the different stakeholders. Checkland (2006) uses the metaphor of “commodity”, embodying power, to show how power is expressed, controlled and used in the conflict situation. Checkland's (2006) understanding of power derives from the Aristotelian school of thought, which elaborated on ideas about the creation of power-based structures for accommodating differing interests in society and human groups.

### *The Influence and Importance Matrix*

The Influence and Importance matrix aims at depicting the degree of influence stakeholders have over activities and decisions connected to the present issues and their level of importance. Influence describes the power of each stakeholder either to affect the decision making processes within the conflicted situation positively or negatively. The level of importance is characterized by the level of priority that is given to fulfil the needs and interest of each stakeholder (Hunjan, 2011).

### *The Venn-Diagram*

The Venn-Diagram is used for depicting the key individuals, groups and institutions in a community and their relationships and importance for decision-making. Circles indicate the key stakeholders. The size of the circle shows the relative importance of the stakeholder towards the decision making process. The larger the circle the more important is the stakeholder for the decision making. Not only the circles and their sizes can be interpreted, but also their constellation to each other. The closer they are to each other, the better and more frequent is the contact between the stakeholders, regarding cooperation, passing on information and decision making (Kumasi, 2008).

### **3.5 Limitations to the study**

Not all the results of the study can be generalized for other informal settlements in Lima as the observed situation is embedded into a specific setting. Specific results deriving from the analysis of the conflicts in the use of the irrigation channels cannot be transferred to other case studies, but results associated with more general features of informal settlements and experiences from lessons learned during the process of intervention can be generalized.

The participation in the investigations for this study was voluntary and as the given time frame for the intervention was tight, not all relevant stakeholders could be interviewed and included into the study. Therefore the personal perspectives represented by the included stakeholders cannot be generalized for the whole stakeholder group.

Further limitations occurred due to the cancellation of planned workshops, leading to a lack of data and a change in the thesis design.

## 4. Results and Discussion

In the following chapter, the results of the data collection and intervention will be illustrated, explained and discussed.

### 4.1 Historic context

In order to get a clear picture of the development of the conflicts, a time line was constructed. It includes and presents all important milestones leading to the present conflicted situation.

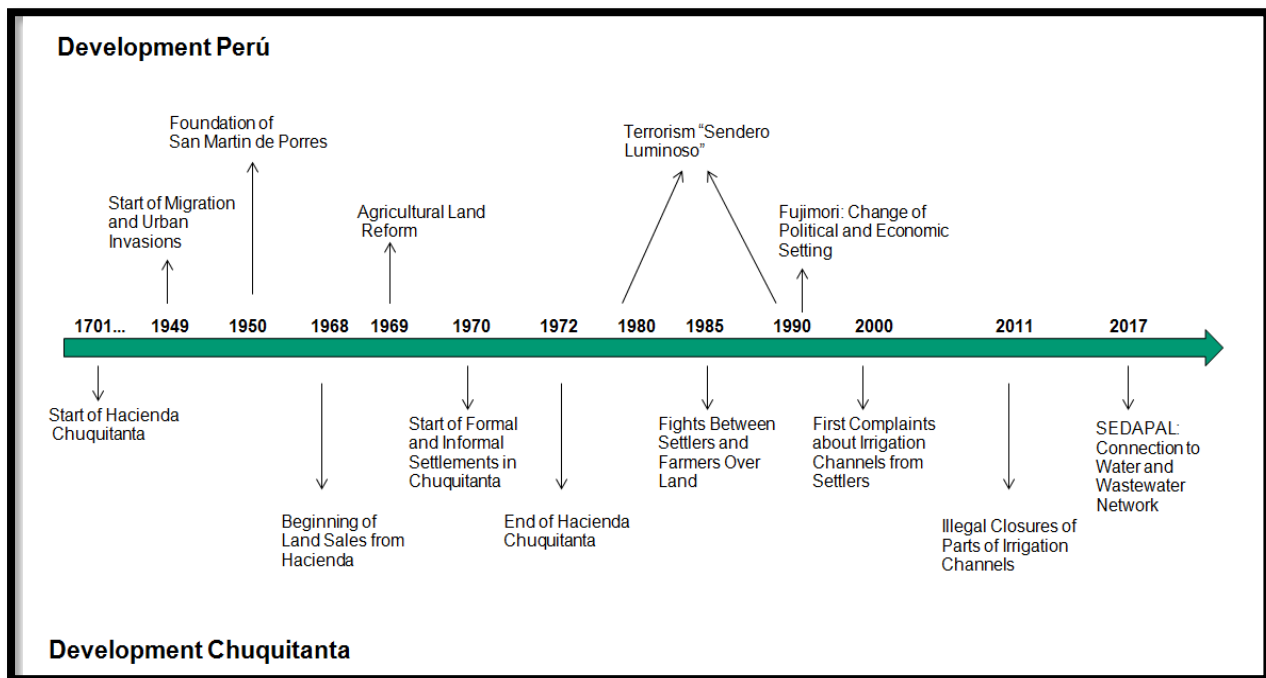


Figure 6- Time Line of important events on a local and country-wide level.

Traditionally the area Chuquitanta and its surroundings have been farmed land. From the 18th century onwards Chuquitanta has been a hacienda, producing various agricultural products like sugar cane, cotton and potatoes. Around 200 workers were employed and lived in the hacienda. Infrastructure provided for them from the landlord was a church and a school for their children. After many years of unaltered land use in the area, changes in land occupation patterns and land use started to occur.

In the 1940s around Hacienda Chuquitanta informal urbanizations started to take place, occupying more and more land. One of the reasons for increased urbanization were the growing migration movements from Peruvians of the Andes towards the capital in search for work and better living conditions in general (De Soto, 1986). Due to the increase of urban settlements within the area of and around Chuquitanta the municipality of San Martín de Porres was founded in 1950 (Rivas, 2013). The year 1969 has been marking the beginning of crucial changes in land use of

Chuquitanta. These changes were the consequences of a bigger political decision, namely the “Agricultural Land Reform”, initiated by the Velasco government. This reform brought a change to the century old tradition of agricultural haciendas in Perú. Haciendas throughout the whole country were compulsory liquidated; the owners had to sell their land. In the case of Chuquitanta, the land was sold to the family members of the owner and to around 35 of the former workers (Perez, 2013). In 1970 all of the land was sold and therefore marked the end of the Hacienda Chuquitanta.

During the early 1970s human settlements started to take place in Chuquitanta, as many land owners sold their land to new residents. The land transactions happened through the means of the informal market, because officially the land was designated as agricultural area and therefore not supposed to be used for the establishment of human settlements. According to Perez (2013) the municipality responded to those illegal land transactions with a “laissez-faire” attitude and was therefore not interfering with the informal urbanisation process.

The 1980s were a period, in which Perú was heavily influenced by national terrorism. The terrorist organization “Sendero Luminoso” was active throughout the whole country, but especially in the Andean regions. Fights between the terrorist organisation and the Peruvian government occurred, resulting in around 20 thousand killed Peruvians (Starn, 1995). Due to these terrorist activities many people fled from the highlands into the coastal areas, leading to an increase of human settlements in Lima and also in San Martin de Porres. As a result of this increased human pressure on land, fights between farmers, protecting their agricultural land and new residents took place in Chuquitanta (Perez, 2013).

According to interviewed farmers and residents the 80s were also the time, when the residents first felt disturbed by the channels, and also when the problems with contamination of the channel water through waste and waste water started to appear. Perez (2013), a former farmer remembers that around this time the prawns started to disappear from the channels. Therefore the channels, which were used before for irrigation, drinking water, fishing and laundry by farmers and residents lost their non-conflicting functionality towards other forms of use, like waste water inlets and waste dumping.

## **4.2 Description of stakeholders**

The different, relevant stakeholders will be described in the following paragraph more closely. The stakeholders were sorted into the categories “Primary Stakeholders” and “Secondary Stakeholders”. The “Primary Stakeholders” are the ones, who are directly affected by the conflicts about the use of the irrigation channels, as they either have interests connected to the channels or live in close distance to them. The governmental entities, the municipality and LiWa are the “Secondary



Stakeholders”, because they are not directly affected by the conflicts, but still having an interest, or responsibility towards the channels.

### *Primary Stakeholders*

The members of the Farmers’ Association are local farmers. The office is located in Chuquitanta and lead by three female farmers, Cecilia Salaryan (President of the Association), Albina Palacios (Secretary) and Eloiza Córdoba (treasurer). The Association is responsible for the organisation of the use of the channels. Farmers have to register for the use of the irrigation channels.

Concerning the maintenance of the irrigation channels, the Association is working together with the Local Ministry for Water. The channels are cleaned 5-6 times per year with machinery.

The farmers in Chuquitanta irrigate their fields with the water of the channels. Many of the farmers live outside Chuquitanta. Mostly they sell their products on local, informal markets, as they do not meet quality standards. Some of the farmers maintain their fields with machinery, but still many do the work manually.

The settlers and property owners significant for this study are the ones who either live along the channels, or use the channels for another purpose than irrigation, because they are directly affected by the current state of the channels or they directly affect it. The term “settlers” refers to the residents, who do not have land titles, even if they have been living in Chuquitanta for several years. Many settlers rent their lots from property owners, some possess their own lot, but without being registered. Most of the settlers are not active in farming, but engage into small businesses.

In this work, “property owners” refers to residents, who have land titles and who are registered as landowners. Many of the property owners rent out lots on their properties, not living there themselves an more.

### *Secondary stakeholders*

The Local Department for Water (ALA) is a department of the National Authority of Water. It is responsible for the administration of the three river basins Chillón, Rimarc and Lurin. Moreover this department, together with the farmer's association, is responsible for maintaining the irrigation channels in Chuquitanta.

SEDAPAL is a state-owned company, providing water and sewerage services for Lima and Callao. It was founded in 1981. The company is a relevant secondary actor, because it holds plans for establishing water and sewerage systems in Chuquitanta by 2017.

The Administration for Urban Development is a department of the Municipality Lima. It is responsible for formulating, evaluating and authorizing plans for urban development in Lima. (Munlima, 2013).

It was not possible to include this identified stakeholder into the studies, because employees of the administration could not find time to participate.

Chuquitanta is part of the municipality of San Martin de Porres. The municipality is responsible for the financial administration, human-, economic- and urban development and security of its districts (San Martin de Porres, 2013).

The LiWa project team is working in the area of Chuquitanta on a project about public green spaces and the construction of an organic sewage treatment facility for improving the quality of the water in the channel “Canal Central”. Therefore the involvement in Chuquitanta of LiWa is not directly linked to the conflicted use of the irrigation channels.

### 4.3 Rich Picture- the conflict situation expressed and unstructured

The rich pictures depicted here have been developed throughout the process of investigation. Their development has been a dynamic process, the first picture growing with each new interview and feedback, finally leading to the second picture. They aim at illustrating the complexity of the conflicts about the irrigation channels in the richest, possible way. Besides comprising crucial structures, processes and present issues of the conflicted situation, they display the main viewpoints of the involved stakeholders and their relational climate (Wilson and Morren, 1990).

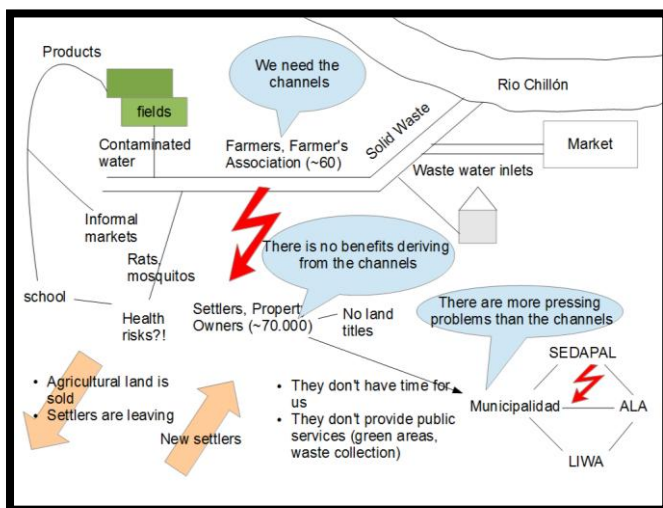


Figure 7- Rich Picture 1

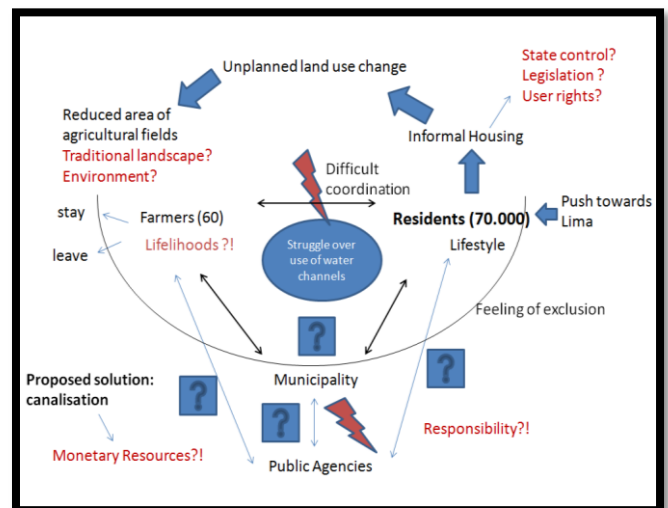


Figure 8- Rich Picture 2

#### *Problem situation expressed*

Chuquitanta is an informally developed area in the northern outskirts of Lima. The former and traditional use of the area has been agricultural, but due to rapid urbanisation the number and surface area of remaining agricultural fields has been progressively reduced from around 20ha to 4 ha (Velásquez, 2013). Due to persistent arrivals of new residents in the area their number by now

adds up to 70.000, whereas the number of remaining farmers decreased down to 60 households. These farmers are still cultivating their fields, using existing irrigation channels, which extract water from the nearby river Chillón. The informal allocation of lots did not take into consideration the route of the irrigation channels, consequently many parts of the channels are now crossing properties and dwellings were built close along the channels, without considering any safety distance.

The purpose of the irrigation channels has been altering during the process of urbanization, as increasing human activities along the channels have led to differing usages of the channels, such as for waste dumping and as inlets for sewage water, resulting into contaminated irrigation water in the channels. Due to the fact that the irrigation system is an open access resource, the coordination of the use and the exclusion of unwanted users are difficult to implement. Moreover the change of usage of the channels has negative effects on the farmers' livelihoods, as they cannot sell their contaminated products on formal markets. In comparison the residents' livelihoods are not affected by the current state of the irrigation channels, but their quality of life is reduced, as the accumulating garbage and contamination leads to increased appearances of rats and mosquitoes, to disturbing malodour and to seasonal flooding of some of the houses.

Most of the stakeholders (farmers, residents, municipality, ALA) proposed the canalisation of channels and the redirection of certain parts of the channels as solutions, viable for improving the situation, due to the following reasons. The closed channels or relocated channels would become less disturbing for the residents and it would become more difficult to deposit waste in and along them, leading to cleaner water and reduced amount of rats and mosquitoes. But the proposed solution has been proven to be difficult to implement, due to unclear responsibilities for the funding and also due to a lack of financial resources. In general the conflict situation is framed by a lack of financial resources. The public agencies and the municipality have to work within the limits of their restricted budgets. The financial situation of the residents and the farmers is restricted as well; most of them involved into small informal businesses, often without any stable income and secure working conditions. The present economic activities in Chuquitanta are farming and selling of vegetables, recycling businesses/ pig farms, informal markets, restaurants and shops and services like hairdressers, car repair shops and internet cafés.

Furthermore the conflicted use is shaped by a high degree of uncertainty concerning regulations and user rights of the irrigation channels. Neither the private stakeholders nor the public stakeholders have a clear understanding of the relevant and necessary laws and regulations, due to the blurriness of the legal state of the partly informal and partly formal settlement. Additionally the control of the state in the area in general and concerning illegal sewage inlets and waste dumping into the channels is not frequent.

Concluding it can be stated that the situation in Chuquitanta is characterized by complexity and uncertainty. Its complexity arises from human factors as informal urban growth, poverty, human behaviour and human activities. Uncertainty stems from human relationships, economic instability and unclear roles/ responsibilities of the involved stakeholders.

### *The different perspectives*

As visible from the Rich Picture, the stakeholders expressed very different perspectives of the conflicted situation. In the following paragraph the main viewpoints will be illustrated.

The farmers' perceptions are grounded in their agricultural work and their need for existing and well functioning irrigation channels for sustaining their livelihoods. They perceive themselves as a small marginal group (~60 farmers), which is more and more marginalised by the residents (~70.000), concerning space and land use.

The settlers and property owners hold the view, that the irrigation channels in their current state are useless, causing more problems than benefits, because the water is contaminated and the channels filled with garbage. Furthermore the contaminated channels are seen as sources for diseases and as a disturbing land structure within their living space.

The municipality recognizes the existence of the conflicts about the use of the irrigation channels, but from their point of view there exist more pressing problems in the area of Chuquitanta, like the illegal pig farms. In general Chuquitanta is perceived by some employees of the municipality as a marginal and depressing place.

In the perspective of ALA the problematic situation has to be seen in a bigger context, because the irrigation channels are connected to the River Chillón, which is itself already contaminated from waste water inlets from industries and villages further upstream.

Members of the LiWa project hold the view that the conflicts around the irrigation channels are too complex and too messy in order to be improvable through the facilitation of LiWa.

All the stakeholders share the opinion, that the canalization of the channels would be an improvement to the current situation.

### *Relational Climate*

The farmers feel excluded from decision-making processes between the residents and the public authorities concerning the further development of the area. This perception of exclusion is accompanied by a feeling of powerlessness, as the group of farmers is outnumbered by far by the group of residents.

The residents' emotional perspective of the situation is dominated on the one hand by fear of deteriorating their chances of obtaining land titles, in the case of communicating openly their anger

and discontent about the current state of the irrigation channels towards the public authorities. On the other hand they feel excluded from communication between farmers and the public authorities. The municipality faces the problems concerning the use of the channels rather indifferently, as in the area of Chuquitanta other problems are perceived as more important. For example the handling of illegal pig farms, polluting the soil and subsequently the groundwater and river Chillón are given a higher priority by the municipality.

Due to the persistent conflicts between residents, farmers, the municipality and involved institutions the overall relational climate between the stakeholders is characterized by mistrust and anger. The conflict situation is perceived by many stakeholders as very difficult to improve.

#### 4.4 Power relations and underlying power structures

##### *Venn-Diagram*

In this Venn-Diagram the findings of the fieldwork have been arranged in a way that:

- the relationships and levels of communication between the stakeholders are depicted
- the importance of the stakeholders regarding decision-making processes is shown
- the level of involvement of the stakeholders into the conflicted situation is illustrated

Within this context, the term “importance” is understood as the potential power to influence decision-making processes.

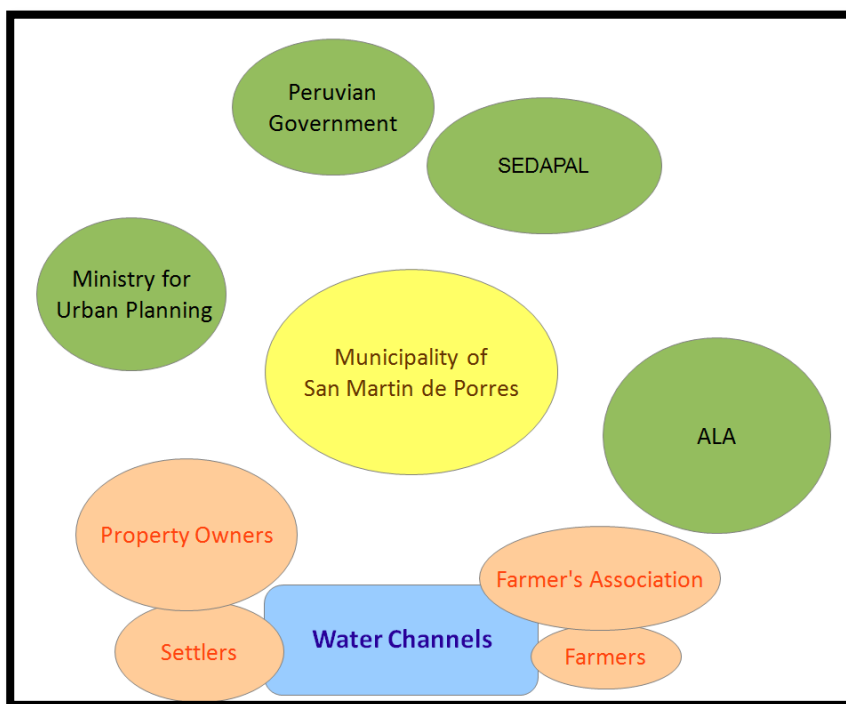
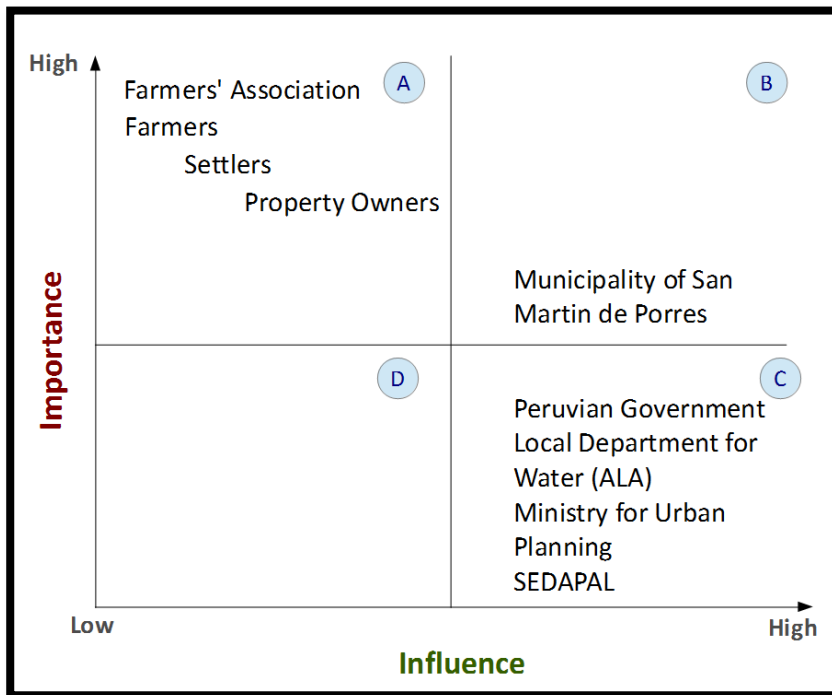


Figure 9- Venn diagram.

### *Influence-Importance Matrix*

The following matrix will give insight into the stakeholders' roles concerning their importance within the conflicted situation and their potential level of power concerning decision-making processes.



*Figure 10- Importance-Influence Diagram.*

### *Analysis of Power structures*

The settlers, the property owners, the farmers and farmers' association are closely involved into the conflicts about the irrigation channels. They are the ones, who are directly affected by the current situation and who would also be strongly affected by any changes to the present situation. Regarding the communication between these stakeholders, there is exchange between the property owners and the settlers, as well as between the farmers and the farmers' association. But between those two groups the communication is difficult and not frequent. The level of importance for decision-making processes is rather small for these stakeholders, but within this stakeholder groups differences in the level of importance occur. The farmers lack power and influence, as they are a small in number. Potentially, the farmers' association has more power to influence, because as an association it is in contact with the Local Department for Water (ALA) on a frequent basis, therefore having better possibilities for communication and taking part into decision-making processes. Moreover the association, as a formal body, has more legal rights and more possibilities

to make use of present rights, than residents and farmers by themselves. Despite this potential high level of power, the actual power of the association, as observed during the investigations is rather low.

The group of residents is large, therefore holding potentially more power to influence than the farmers. Within this group, distinguished has to be between the settlers who do not possess land titles and therefore due to their informal status have less potential power than the property owners.

The Municipality of San Martin de Porres is less involved in the conflicts, than the directly affected stakeholders, but due to its duties and responsibilities in general and also for public services within Chuquitanta, the Municipality is important for potential improvement to the situation. The communication between the municipality and the directly stakeholders is not very frequent and also not very balanced. More efforts for communication are made on the farmer's and resident's side. The potential power of the municipality to influence decision-making processes is high, but the municipality seems reluctant to get involved in the problematical situation.

Regarding the public institutions, there is only very little communication in between the different governmental institutions and also between them and the municipality. Clearly the governmental institutions have a high potential power position in decision-making processes, but as they are not directly affected by the conflicts, they are not likely to interfere to a high extent in the conflicted situation. The Local Department for Water (ALA) is more closely linked to the farmers and farmers' association, than to the residents and property owners. This derives from the fact that the farmers' association and ALA work together on the maintenance of the irrigation channels, and therefore a frequent communication is given. The potential power of ALA for influencing decision-making processes is high, but given the findings of this study, the department is not likely to intervene into the conflict situation.

As a result it can be concluded that in general the level of communication between the different stakeholder groups is rather low. Furthermore the public agencies and the municipality hold high potential power to influence the situation in comparison to the settlers and residents. Possible reasons for the reluctance of the public agencies and the municipality to actually live up to their potential power will be discussed in the General Discussion.

The LiWa- team has been left out of the diagrams. It is admittedly classified as a secondary stakeholder, but its role within the power structures has to be seen apart from the other stakeholders, as its stake is based on a voluntary basis. Nevertheless it can be stated that LiWa holds a position of high potential power for facilitating change, as the project is in frequent contact with all of the stakeholders and functioning communication has been established. Moreover the LiWa-team has been working with most of the stakeholders for around 5 years and therefore possesses the potential

power to influence decision-making processes.

### *Expression of power - commodities*

In the following paragraph the commodities which seemed to be the most significant ones for influencing the dynamics of the situation will be elucidated in more detail. Power was expressed by the different stakeholders in differing ways, under use of various commodities of power.

The commodity “access to information” seemed to be crucial for the dynamics within the conflict situation. The transformation of information was handled very carefully and inclusively between all stakeholders. Residents and farmers mentioned that information of the municipality concerning official-public meetings were not handed on or distributed publicly, so that only an inclusive circle of citizens, able to access the necessary information, was able to attend. Between the public authorities a lack of information transfer could be observed. The findings of the study suggest that the different authorities are not used to cooperate. Moreover structures for information transfer, like a common platform or frequent meetings, were missing.

The municipality expressed their status of power towards farmers and residents through a commodity of neglect which was expressed in various ways. Firstly by setting a quite low priority for dealing with the conflicts about the use of the irrigation channels, the prospect of solving the conflict with help from the public sector was diminished. Furthermore the municipality does not provide the citizens of Chuquitanta with adequate public services. By neglecting its public duties without the residents being able to hold the municipality responsible for it, the municipality expresses their relatively higher status of power compared to the farmers and residents.

Having a land title, therefore being a legally recognised property owner, is a commodity of power, significant for residents and farmers. The ones holding the land titles, are protected by law and therefore experiencing a higher status of security. Accompanied with having land titles is the higher status of wealth, being also an important commodity of power, as many residents and farmers struggle to maintain their basic way of living on a daily basis.

### *Perceived Power positions*

In general, the group of farmers and the group of residents talked openly about their perceptions of prevailing power relations between the different stakeholders in order to draw attention to persisting power inequalities. Also many indirect remarks concerning power were made.

The group of involved farmers perceived its status as relatively powerless compared to the other stakeholders. As mentioned before, the farmers perceive their group as small and marginal, excluded from political decision-making processes (Farmers' Association, 2013). During the group



discussion (2013) it was mentioned that the municipality does not give high priority for solving the conflicted use of the channels. On the other hand the relative low power of the municipality concerning presence and control of the development and management of Chuquitanta was discussed.

Throughout the interviews and informal conversations with the residents it became clear, that residents with land titles (property owners) are perceived as more powerful as residents without. In many cases property owners rent out lots to tenants on their land (Perez, 2013), therefore deciding about who to live on their ground and how living is structured.

The involved public institutions talked less openly about power than the other involved stakeholders, therefore their perceptions on prevailing power relations are more difficult to understand and to describe. Observations made throughout the investigation suggest that on the one hand employees of public institutions perceive themselves as more powerful as the residents and farmers on a personal level, as their social status is higher due to their formal and secured job and also due to their “better” living conditions in wealthier areas of Lima. On the other hand concerning the power positions of the public institutions in general the employees expressed a perception of powerlessness towards managing the present situation in Chuquitanta, due to a lack of resources and the complexity of the situation.

The LiWa team expressed a perception of powerlessness for facilitating change, due to the messiness of the situation.

## 4.5 Areas of concern

During the stage of data collection, the involved stakeholders expressed their areas of concern. Some of these issue areas differed between the stakeholder groups; others were comparable or even similar to each other. In the following the mentioned areas of concern of the different stakeholder groups will be stated and elaborated.

The residents were worried about the health risks stemming from the increased presence of rats and mosquitoes, due to contaminated water and the disposed waste in the irrigation channels. These issues are concerns of basic well-being. A further area of concern is the perception of being left out of decision-making processes concerning the future development of the area and the irrigation channels. A female settler (2013) expressed that notion by saying *“sometimes there are employees of the Public institutions coming to our area, doing some investigations, but then there is no further action afterwards*. This perception of “being marginalised” is intensified by the insufficient provision of public services, especially garbage collection.

The group of farmers involved in the investigations mentioned especially that *“the non-compliance*

*of settlers with governmental development plans is threatening our livelihood*” (Anonymous Source, 2013) as an area of concern, that is affecting their survival and basic well-being. Not only present threats to their livelihoods were mentioned as an area of concern, but also the uncertainty concerning their future as farmers and the future of their children. Another area of concern expressed was the feeling of no support of the Public Institutions towards finding a solution or improvement to the situation, because “ *the municipality does not give high priority to our problems with the channels*” and “*the municipality does not include us in political decision-making processes*” (Group Discussion, 2013). One farmer (Anonymous Source, 2013) mentioned the concern that the “*disconnection of many new settlers towards the area as their home*” is leading to their lack of interest in conserving farming activities in Chuquitanta.

Employees of the municipality (Anonymous Source, 2013) mentioned insufficient governmental funding for dealing with the present conflicts about the use of the channels as an area of concern. Another area of concern mentioned by the municipality is the non-compliance of residents with the official development plans. In the perception of the municipality the informal housing market in Chuquitanta is responsible for the problems with the use of the irrigation channels, because it is working apart of the formal property and housing regulations, fostering unplanned urbanization, which is leading to uncontrolled land use change. A development plan of the area exists; it was developed by the Administration for Urban Development, the urban planning department of the municipality Lima. This plan designates many parts of Chuquitanta as agricultural land.

ALA expressed a generic area of concern, by stating that in general, there is “*no recognition of the importance of clean water resources*” (Velásquez, 2013). In his opinion this ignorance towards the importance of clean water stems from missing environmental education of the public. As further areas of concern Velásquez (2013) mentioned the missing cooperation between public authorities in the matter of water resources management in Chuquitanta and the lack of governmental control in the area.

The project team “LiWa” expressed the area of concern of unrealistic expectations from the affected stakeholders towards the role of LiWa in finding and financing solutions for the conflicts.

## **4.6 Limitations to improvement**

Based on the areas of concern expressed by the involved stakeholders and collected information concerning the conflicted use of the irrigation channels, limitations to improving the conflict situations were developed. The Limitations were categorized into direct and indirect limitations.

#### 4.6.1 Direct Limitations

In this category of limitations, the limitations directly affecting the conflict situation will be stated and explained.

##### *Climate of distrust between stakeholders*

Between the stakeholders prevails a climate of distrust, which is accompanied by emotions of fear and uncertainty on the farmers' and residents' side. Linked to this is that the communication between the different stakeholders is difficult, resulting into very little exchange of information.

##### *Unplanned urbanization*

There is a lack of control from the government and municipality towards the compliance of the residents with the governmental plans of urban development. The development of housing in Chuquitanta has been happening to large parts without considering any public or authorized plan, therefore evolving to a high extent informally. Still nowadays in Chuquitanta properties are often traded on the informal market. Many of the territories are sold without the permission of the municipality. Due to the informality of the property market, detailed information about the properties on sale in many cases is not given. Some residents bought territories without knowing details, like canals crossing their properties.

##### *Lack of fulfilment of duties by municipality*

Another factor mentioned by various stakeholders was the insufficient provision of public services by the municipality. Many of the property owners and settlers are paying monthly taxes to the municipality, but public services, like waste disposal, provision of green spaces and health infrastructure are not provided from the municipality. The missing waste disposal service was mentioned by various stakeholders as a reason and driving factor for the illegal waste dumping in the irrigation channels.

##### *Chuquitanta- an intermediary station*

Many of the residents and also farmers do not perceive Chuquitanta as their home, but rather as an intermediary station on the way to a better life. There is a high fluctuation rate of new residents coming to Chuquitanta and other residents and farmers, who sell their properties and leave the area. Due to this many residents in Chuquitanta do not have an emotional connection towards the area which is one of the factors leading to a certain level of carelessness towards the preservation and development of agriculture and the area in general.

#### *Unclear responsibilities of Public Authorities and Residents*

There is a high degree of uncertainty concerning who of the stakeholders is responsible for dealing with the conflicted use of the irrigation channels and also who would be responsible for the funding of possible solutions, either the farmers, the residents or the municipality.

#### *Lack of resources*

There is a lack of sufficient resources available to the public authorities, especially an ample amount of money for either dealing with the conflicting use of the irrigation channels or with implementing the proposed solution of canalizing the irrigation channels.

As mentioned before, the economic sector in Chuquitanta is mostly based on small scale informal activities, therefore the residents' and farmers' income is mostly less than moderate.

### **4.6.2 Indirect Limitations**

In this category limitations are listed which are not directly connected to the struggle over the irrigation channels, but still having an deteriorating influence towards improving the situation.

#### *Missing cooperation between and within Public Authorities*

A lack of cooperation and collaboration between the different ministries and also between the municipality and the ministries could be observed. Ministries basically work on their own, not exchanging information about planned and implemented projects and agendas.

Also within the public authorities the cooperation of different public servants seemed difficult and often accompanied by prejudices and distrust. Changes of leading governmental parties lead to changes in composition of public servants in public authorities. The quality of working relationships is closely connected to the willingness to cooperate of single persons and also to their agendas. As the composition of staff alters in frequent time intervals, the establishment of good working relationships is difficult.

#### *Missing information and scientific data*

During the investigation phase of this study it became evident, that specific, scientific data on environmental conditions, like the status of water, soil and air for Chuquitanta was missing or not accessible, as the public institutions, ALA and the municipality did not possess any studies on that matter.

#### *Environmental pollution of water in general*

According to Velásquez (2013), an employee of ALA, the river Chillón is already polluted from

industries and towns upstream. Major polluters have been identified by employees of ALA. Due to the polluters upstream, the water entering the irrigation channels is already contaminated, before the contribution of the illegal waste disposals and sewage inlets of the residents. The apparent environmental pollution of the River Chillón by private polluters points out missing law enforcement of the government regarding the compliance of the private sphere to environmental standards.

#### **4.7 Open-access-status of irrigation channels**

As illustrated in the limitations, none of the conditions identified by Dietz et al. (2003) as necessary for an effective management of common pool resources is present in the use of the irrigation channels in Chuquitanta. The management of the irrigation channels is characterized by missing information about the use of the channels and also missing information about the quality of the water. The rate of change concerning the number of users is high due to the fluctuation of residents and farmers. Furthermore external users are difficult to exclude from the use of the irrigation channels, as governmental enforcement is low. The frequent communication between the user groups is not given and the users do not actively support rule enforcement and monitoring of the channels. Besides the factors mentioned above, the dissimilarity of interests by farmers and settlers in the use of the irrigation channels is one of the driving factors hampering the collective management of the irrigation channels. The farmers' interest on the one hand is the use of the water in the channels for irrigating their fields. On the other hand the residents use the irrigation channels for waste dumping and waste water sewage which is subsequently contaminating the water in the channels. The residents' interests in the use of the channels emerge mainly through the interactions of social and institutional factors. The non-functioning public garbage collection and the missing waste water treatment facilities within the settlement are directly affecting the specific interests in the irrigation channels by the residents. Therefore the establishment of a functioning garbage collection and the connection of the houses in Chuquitanta to the public waste water and water network would be crucial for accommodating the differing interests of the user groups. In regard to that the governmental water supply company SEDAPAL plans to connect Chuquitanta to the public water network by 2017. Until then the only alternatives for sewage inlets are subterranean sewage tanks. Many, but not all the houses along the irrigation channels possess these tanks. Concerning the dumping of garbage in the irrigation channels by the residents the only alternative to a public garbage collection are informal pig farms. The pig farms take in all kind of garbage at the owner's expense. At the pig farm the garbage is either eaten by pigs or burned. In Chuquitanta several pig farms exist.

## 4.8 The ideal situation in a soft systems thinking world

Due to the reason that it was not possible to apply the complete learning cycle of the soft systems methodology to the real life situation in Chuquitanta within the frame of this study, the following paragraph is going to look into the question “how the situation in Chuquitanta would look like in a perfect soft systems thinking world”. Soft systems thinking implies the acknowledgement of socially constructed realities, framed by the specific world views, people inhabit. A further notion of soft systems thinking is that systems do not exist in reality, but that they are tools for reducing and understanding the complexity of the real world.

Based on the theoretical framework of soft systems thinking, the Soft Systems Methodology contains four main activities. Those are:

- Finding out about the situation by including many different perspectives
- Building purposeful activity models
- Debating the situation on the basis of the developed models
- Taking action to bring about change.

This study applied the first two stages of the SSM to the situation in Chuquitanta, including as many relevant stakeholders as possible, in order to obtain the richest possible picture of the situation. This happened, taking into account that there is always more information to gather and therefore the investigation phase actually never ends, but is part of the whole learning cycle.

After having completed the first two stages, as far as completion is possible, the intervention would now step into the stages 3 and 4, developing root definitions of relevant systems and conceptual models with the participation of relevant stakeholders. The conceptual models are based on specific and declared world views and act as intellectual tools for structuring and investigating the present situation. Moreover the models are used for fostering discussions about the present situation by the stakeholders, so that a more accommodated understanding of the different perspectives and interests can be achieved. By providing the stakeholders with a platform for discussion and exchange, it is aimed at giving voice to all included stakeholders. In the case of Chuquitanta, possible conceptual models, based on the areas of concern, could be human activity systems about the “climate of distrust”, “lack of communication between the stakeholders” and many more, depending on the involved stakeholders and their perception of the most crucial points of intervention. By discussing about the developed conceptual models, the stakeholders might accommodate their differing perspectives and identify desirable and feasible changes to the situation. The optimal outcome of this first complete round of the learning cycle would be the implementation of actions, previously determined in an action plan. In Chuquitanta possible actions might be the organisation of regular meetings between the different stakeholders, the establishment of communication and information

platforms, the improvement of the garbage collection service by the municipality, just to name a few. As the learning cycle of the Soft Systems Methodology is iterative, the stakeholders within the situation could go through further cycles, depending on the situation with the outside help of a facilitator or with a facilitator from within.

## 5. General Discussion

The main objectives of this study are, as stated before, to obtain an understanding of the situation by involving the different perspectives of relevant stakeholders, to identify and discuss limitations for improvement and to propose possible improvements to the situation. Therefore in this chapter, the limitations will be elaborated on further and in a more profound way, considering their greater theoretical context. The discussion will draw on theories already elicited in the literature review and also on relevant findings made in the field. Furthermore it will be discussed, to what extent improvements could be developed within this study.

### 5.1 Social components of the conflict

#### *Access to Land*

Adequate access to formal land in Lima is still an unresolved issue for many of the urban poor, as the process of obtaining a land title and being registered in an official housing register is a time consuming and costly process. For the property owner Perez (2013) the formalization of his property took him more than 10 years. Other residents mentioned the high costs regarding the formalization process as a reason for not having land titles and therefore not integrating themselves in the formal system. This phenomenon of preferring the informal system to formality has also been observed in other case studies, like in the case of informal housing in Dar es Salam, Tanzania. Due to the high costs and often only slightly improved economic status of formalizing property, especially the poorer residents of the city chose to keep their informal living status (Briggs, 2011). Besides the monetary and temporal aspects a further restricting factor for accessing land is the access to administrative and juridical systems which can only be obtained by education and literacy, information and networking. All these are requirements that residents of informal settlements often do not possess (Fernandes, 2011).

#### *Provision of Public Services*

Access to adequate land is closely connected to the provision of public services. The lack of providing adequate public services for the citizens of Chuquitanta can not only be analysed from a power-based perspective. Other findings suggest that the inadequacy of services provided by the state stems from political factors. The regularization programme applied in Perú since 1996 has been focusing mainly on formalizing tenure through titling, without including the upgrading of social services, job opportunities and community structures (Fernandes, 2011). Moreover, the



process of formalizing whole settlements can take many years until being completed, public services being provided gradually, also due to the Peruvian law, which allows the construction of settlements before basic infrastructure like electricity and water connections are installed.

As mentioned before informality in housing can result into high costs for the inhabitants. Many houses in Chuquitanta are not connected yet to the public water system; the inhabitants purchase their water from water trucks, paying a higher price than they would for public water. Concerning the further development of water supply in Chuquitanta, the state-owned water company SEDAPAL plans to set up water and waste water disposal systems in Chuquitanta by 2017. This would be a further step for the inhabitants of Chuquitanta towards a higher formal living status and it also might bring improvement to the quality of water in the channels, as the illegal sewage inlets will be replaced by the public waste water system.

### *Life in the margins*

The emotional disconnection of citizens from their urban home and neighbourhood is an issue, also discussed in further literature. According to Yiftachel (2009), urban spaces captured between informality and formality, are “gray spaces”, “They are neither integrated nor eliminated, forming “pseudo-permanent margins” of today’s urban regions” (Yiftachel, 2009). These stated perceptions of temporariness and “living in between” can also be observed in Chuquitanta and is also perceived and stated by residents and farmers. The emotional disconnection is reinforced by a lack of governmental presence concerning the provision of public services, leading to an additional official marginalisation of the area. Therefore these “pseudo-permanent margins” are formed and shaped on different levels, on personal and public levels, on emotional and rational ones. The effects are emotionally polarising, leaving the citizens of informal areas in an emotional “gray” zone, in between desperation and hope, the informal area reduced to a temporary station, where citizens live without emotional involvement into their community.

### *Climate of distrust between the stakeholders*

The present climate of distrust was observed as an acute problem during the intervention. Especially the involved farmers and residents showed a strong notion of suspicion about the goodwill and well-intentions of the public institutions towards them, grounded in the perceived non-presence of the government in Chuquitanta in the present but also throughout the past. As distrust is a hindering factor for resolving conflicts (Lewicky and Wiethoff, 2000), trust repair would be crucial for a positive development of the current situation. Trust repair is a multi stage process which needs time to unfold. Its successful development is very much depending on positive experiences of mutual adherence to arrangements during the process (Lewicky and Tomlinson, 2003). Therefore, the

process of trust repair is not straightforward and depends on the continuous involvement of all relevant stakeholders. Addressing the persistent high level of distrust between the stakeholders in Chuquitanta through the application of further stages of the SSM methodology might be an option for improving the current situation. Nevertheless in order to repair trust in the long term, the municipality and the public agencies would have to follow transparent and clear agendas and live up to their duties and promises.

## **5.2 Environmental components of the conflict**

### *Environmental consequences of unplanned land use change*

Examples all over the world show that the establishment of informal settlements can result into environmental degradation, pollution and subsequently in safety and health risks for the population (Fernandes, 2011). Especially degradation of fertile soil and the deterioration of water resources are direct environmental impacts of urbanization and accompanied industrialisation in cities all over the world (Kurucu and Chiristina, 2008). Illegal waste dumping is likely to contaminate the surrounding soils and water resources in Chuquitanta. Unfortunately, due to missing studies and environmental impact assessments in the area, the assumptions about the status of the soils and water cannot be scientifically proven.

Further studies suggest that rapid and unplanned urbanisation in the global south is a crucial factor for the homogenization of plant and animal species in urban fringes (Pauchard et al., 2005). In the case of Chuquitanta the constantly increasing level of housing in the formerly agricultural area displaces arable land with urban infrastructure, leading to a perceived decreased level of biodiversity. Several stakeholders in Chuquitanta mentioned the former presence of different fish species in the river Chillón and in the irrigation channels. According to their statements the species started to vanish around 20 years ago, due to increasing contamination of the water in the channels. In general various international studies about the environmental impact of unplanned land use change and urban sprawl exist, most of them suggesting deteriorating effects on the environment, strongly suggesting that also in Chuquitanta the rapid urbanisation is having deteriorating environmental effects. But in order to analyse this hypothesis and to find out about actual effects, scientific studies would be essential.

## **5.3 Institutional components of the conflict**

### *Unplanned Urbanisation*

The development of unplanned urban settlements in Chuquitanta has to be seen in a country wide

perspective. In general terms, reasons for moving into informal settlements on the urban fringes of mega cities, as mentioned before, are often connected to the inaccessibility of formal land for the poor and also that governments fail to provide basic needs. In Perú the centralistic orientation of the state has been leading to a neglect of the development of rural areas, mainly in the Andes and the Amazon. Until today in wide rural areas in Perú, adequate social, health and transport infrastructure is missing, pushing many Peruvians towards Lima.

The past and current informal urbanisation in Chuquitanta cannot only be seen as a limitation for improvement due to its unplanned manner, but also because it increases existing pressure on the use of the channels, by adding more and more stakeholders to the situation. As a common pool resource, the irrigation channels can only supply a certain number of users and every further user affects the benefits of the others negatively.

The high direct and indirect costs for local governments concerning the management of informal settlements (Fernandes, 2000) would suggest that governments would be eager to enforce existing property rights and urban development plans, in order to minimize these costs. Contradicting to this assumption in Chuquitanta governmental intervention and enforcement are perceived by the residents and farmers as weak. Possible reasons for this phenomenon will be discussed by reference to scientific literature and observations made on the ground, in *5.4 The rules of the game- power and interest in informal urbanisation in Chuquitanta*.

### *Power in Conflicts*

The concept of power is a highly contested and discussed one, by many different authors and in various scientific fields (Coleman, 2000). A basic and non- competitive understanding of power was developed by Follett in the early 20<sup>th</sup> century. From her point of view power is the ability of a person to self-govern and to realize desired outcome (Pratt, 2011). In this study, the understanding of power is following Follett's conceptualization.

According to Coleman (2000) most conflicts directly or indirectly concern various forms of power. The findings of this study suggest that also in the presented conflict situation power, in sometimes obvious and sometimes less tangible ways, is a crucial factor. Especially the perceived power positions and unequal power relations between the stakeholders seemed to be driving and crucial factors for the dynamics of the conflict situation. As the farmers and residents perceived themselves as powerless, they remained inactive towards bringing about change to the situation. Other authors like Gaventa (1982) elaborated on the fact that perceived powerlessness can lead to inaction within conflicts. He suggested that these patterns of quiescence can be broken by empowerment of the marginalised actors and by first successful achievements. Furthermore the perception of power positions of the involved farmers and residents were strongly influenced by access to the power

resources (Coleman, 2000) of wealth, legal status and knowledge, strongly indicating that these resources are still missing for these stakeholder groups. In order to bring improvement to the conflict situation, these basic resources need to be made more easily accessible for the residents and farmers. Moreover, the stakeholders mostly affected by the conflicted use of the channels appeared to be the least powerful ones concerning the power to influence decision-making processes, reflecting the fact, that until today in Peruvian society top-down power channels prevail. The empowerment of people on the ground has been happening in other cases in Perú, like the organised resistance of citizens in Cajamarca against mining companies (Bernard, 2012). But in Chuquitanta the bottom-up approach to power and the empowerment of the local citizens is a missing factor, reinforced by the overall marginalising of Chuquitanta by public stakeholders.

As problematic situation evolve over time, so do power relations. Moore (1995) suggests that conflicts and the dynamics of power between the involved stakeholders develop over time and that they are embedded into a historical context. Therefore, in order to understand the current prevailing power relations between the stakeholders, it might be helpful to investigate on the historical development of power in Peruvian society, especially as Perú throughout its history has been shaped by alternating powerful actors, oppressing wide parts of the population and still today the Peruvian society is characterized by strong social disparities.

### *Public Accountability*

In theory public accountability is a central element of democratic politics, ensuring that the interests of the people is advocated and respected by governing instances (Schedler et al, 1999). A basic definition of accountability was developed by Fox and Brown (1998) saying, that it is a process where actors are hold responsible for their actions. Accountability can be obtained through democratic institutions, such as court and legislatures (Kelly, 2003), but also the independent press and NGOs can act as crucial examiners of public accountability.

In practice many countries struggle in ensuring public accountability. This has also been the case in Perú, where in recent history, under president Fujimori, major corruption proceedings within the governmental administration occurred, but where now reforms in the civil service have been introduced (Armstrong, 2005). Nevertheless missing accountability of the municipality to the residents of Chuquitanta was observed as an aspect fuelling the conflict situation. Without being able to hold the municipality responsible for their actions, it will be difficult for the residents to claim the adequate provision of public services. Further investigations on the issue of lacking accountability would be necessary in order to obtain a more thoroughly understanding about the present state and reasons and also to find out about possible improvements.

## 5.4 The rules of the game- power and interest in informal urbanisation in Chuquitanta

According to Yiftachel (2009) as presented above, maintaining informal areas can serve the interests of differing stakeholders regarding economic and political purposes. Therefore in this section the interests behind informality in housing will be discussed on two levels: the theoretical background elaborated in scientific literature and observations made on the ground about the nature of local democracy in Chuquitanta will be examined.

Regarding political purposes of informality in housing Fernandes (2000) discusses political clientelism, where politicians take advantage of informal settlers for elective purposes, as one of the reasons why the actions of public authorities in some cases rather increase informal development than mitigate it. Political clientelism is based on a patron-client relationship. This relationship is characterized by inequality, verticality and reciprocity (Kettering, 1988). Political clientelism, is a practice which might be also in the case of Chuquitanta relevant for explaining the existing informality in development of housing and the interests behind. As mentioned before, the history of formalizing in Peru has often had cases, where politicians were involved in formalizing and titling processes, for the purpose of gaining election votes. Based on this historic context of political clientelism, one could wonder if the political rational of “Providing land titles and public services for illegal settlements in exchange for votes”, is one of the reasons for ongoing unplanned urbanization and the non-functioning of city planning in Chuquitanta and Lima in general. As maintaining informal urbanisation apparently leads to positive outcomes for local governments, the rational of executing city planning seems to be undermined. The discussed political rational also includes that the higher illegal settlers are in number, the better their chances for legalization of their properties through political clientelism, as the more they are, the more influence they can have on elections. Therefore within this theoretical context the farmers in Chuquitanta are likely to be displaced by the development of further urbanization, as they constitute a rather weak group regarding the interests of political clientelism, compared to the residents.

Another party which interests lay in maintaining informality is the “property trafficker”, because he/she receives high monetary benefits from the informal property transactions (Fernandes, 2000). The property traffickers are in a position, where they often can yield higher profits than formal housing brokers, because they do not pay license fees and taxes. Often they do not provide infrastructure and services, assign smaller percentages of the lots to public use and also trade with lots which are below-minimum (Smolka and Biderman, 2011).

On the basis of the discussed above it can be stated that also in Chuquitanta informal urban development serves different interests and stakeholders, but more research would be required for

obtaining a better understanding of the actual dynamics and driving factors behind.

### *Critical review on the application of the methodology*

In general the Soft Systems Methodology is applicable in natural research management, as it is a systems-based approach especially designed for addressing problematical situations involving human activity (Bunch, 2003). It takes into account the complexity of the real world through participatory methods and therefore is able to deliver more realistic actions for improvement than solutions based on blueprints. Furthermore, socio-economic, political and historic factors are considered as crucial for understanding the situation, offering a more holistic approach than other natural sciences. Due to this and due to the fact that it has been successfully applied in various cases over the last decades, the methodology seems to be a valid approach for dealing with complex, problematical situations concerning use of scarce resources.

But as experienced in Chuquitanta, the actual implementation of the Soft Systems Methodology was rather difficult to achieve. The planned participatory workshops did not take place, because the conflicts around the collective use of the irrigation channels seemed to be too complex and too contested in order to be dealt with by the LiWa- project team (Leon, 2013). On the one hand the project team was worried to open the Pandora's Box by dealing with the conflicts and on the other hand the team did not want to raise false expectations of the stakeholders towards LiWa for finding and financing a solution for the problematic situation. Therefore, the project team decided not to intervene into the conflict situation, but rather focus on more technical solutions, like building an organic waste water plant and constructing green public space within Chuquitanta. One reason for the difficulties in applying the methodology in this case might be that the "success" of the methodology is difficult to measure. Thus even if positive change might be occurring within the situation, it might be overlooked easily and therefore not recognized. Another factor is that the application of the iterative learning process of the SSM is time demanding and also requires the involvement of all stakeholders. Therefore for the project team which is financially bound to a donor and which has to present results to these donors on a frequent basis, the application of the SSM would have made too much effort relative to the achieved and presentable success.

Nevertheless even if the SSM might not be used directly for developing improvements for the overall situation, it might be helpful in building local empowerment of the residents and farmers through participatory methods and therefore subsequently leading to positive changes to the situation.

## 6. Conclusion

This study has investigated the present problematical situation in Chuquitanta, arising from the open-access use of the irrigation channels, with the purpose of obtaining an understanding of the situation through the different perspectives of the stakeholders, to identify pressing areas of concerns and limitations for improvement and to develop, if possible, actions for change. The identified limitations were discussed in a broader theoretical context in order to obtain an understanding of the underlying dynamics of the present conflicts.

The findings of this study suggest that the conflicts about the collective use of the irrigation channels are strongly shaped by differing interests of the stakeholders and by unequal power structures. Embedded are the conflicts into a complex network of institutional, social and environmental factors, whereby institutional and social factors dominate. The study has also shown that historical factors strongly influence the present situation and therefore are crucial for understanding the present.

The main limitations, based on the issues of concern stated by the stakeholders, have been identified as the marginalisation and social exclusion of the citizens of Chuquitanta by public stakeholders, a lack of governmental enforcement concerning informal development and a lack of public accountability. All these limitations have been leading to a general climate of mistrust between the stakeholders, making it even more difficult for the situation to improve.

It was not possible to develop concrete actions for improvement to the situations with the participation of the stakeholders, as a full learning cycle of the Soft Systems Methodology could not be applied. Nevertheless the study has identified potential “openings” for initiating positive changes to the present situations. These “openings” are the empowerment of the citizens of Chuquitanta and the continuously fostering of dialogue and exchange of information between the different stakeholders. Especially the empowerment of the citizens is seen as a crucial factor for establishing positive change. For introducing these activities, the facilitation from outside the stakeholders would be necessary, as the most affected stakeholders by the conflicts are the ones positioned the lowest in the hierarchy of power and therefore in need of support. Despite the difficulties in implementing the Soft Systems Methodology within this study for developing direct improvements to the overall situation, the methodology might be a helpful tool for building local empowerment of the residents and farmers through participatory methods and therefore subsequently leading to positive changes to the situation. Besides the recommendations for improvement, it is clear that the public agencies hold a major role of power within the stakeholders. Without the public agencies living up to their responsibilities and duties it will be difficult to initiate long-term change.

## References

- Alphan, H., 2003. Land-use change and urbanization of Adana, Turkey. *Land Degrad. Dev.*, 14: 575–586. doi: 10.1002/ldr.581. Available at: <http://onlinelibrary.wiley.com/doi/10.1002/ldr.581/pdf>. [Accessed: 15.10.2013].
- Armstrong, E., 2005. Integrity, Transparency and Accountability in Public Administration: Recent Trends, Regional and International Developments and Emerging Issues. Economic and Social Affairs, United Nations. Available at: <http://unpan1.un.org/intradoc/groups/public/documents/UN/UNPAN020955.pdf>. [Accessed: 14.10.2013]
- Bernard, A. , Cupola, D., 2012. Scientist Calls Peru Conga Mining Project an ‘Environmental Disaster.’ Interview with Reinhard Seifert. Available at: <http://upsidedownworld.org/main/peru-archives-76/3608-scientist-calls-peru-conga-mining-project-an-environmental-disaster-interview-with-reinhard-seifert>. [ Accessed 08.10.2013].
- Briggs, J., 2011. The land formalisation process and the peri-urban zone of Dar es Salaam, *Planning Theory and Practice*.
- Bunch, M., 2003. Soft Systems Methodology and the Ecosystem Approach: A system study of the Cooum River and Environs in Chennai, India. York University, Toronto, Canada.
- Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung, 2013. Available at: [http://www.bmz.de/de/was\\_wir\\_machen/laender\\_regionen/lateinamerika/peru/index.html](http://www.bmz.de/de/was_wir_machen/laender_regionen/lateinamerika/peru/index.html). [Accessed 13.09.13].
- Calderon, J., 2003. The formalisation of property in Peru 2001–2002: the case of Lima. *Habitat International* 28 (2004) 289–300. Lima, Perú.
- CEDLAS and the World Bank, 2013. Socio-Economic Database for Latin America and the Caribbean. Available at: <http://sedlac.econo.unlp.edu.ar/eng/index.php>. [Accessed 12.09.13].
- Checkland, P., Poulter, J., 2006. Learning for Action. A short definitive account of Soft Systems Methodology and its use for Practitioners, Teachers and Students.



Ceckland, P., 2000. Soft Systems Methodology: A thirty year Retrospective. Syst. Res. 17, S11–S58 (2000). Systems Research and Behavioural Science. United Kingdom, Lancashire.

Checkland, P., 1981. Systems Thinking, Systems Practice. John Wiley & Sons Ltd.

Chion, M., 2000. Dimensión metropolitana de la globalización: Lima a fines del siglo XX. EURE (Santiago). 2002, vol.28, n.85, pp. 71-87. ISSN 0250-7161. Available at:

[http://www.scielo.cl/scielo.php?pid=S0250-71612002008500005&script=sci\\_abstract](http://www.scielo.cl/scielo.php?pid=S0250-71612002008500005&script=sci_abstract). [

Accessed:07.07.2013]

Cockburn, J., 2000. Official registration of property in Perú (1996-2000). Coping with informality and illegality in human settlements in developing cities. ESF N AERUS International Workshop.

COFOPRI, 2013. Official Webpage. Available at: <http://www.cofopri.gob.pe/>. [Accessed: 17.07.2013].

Coleman, P., 2000. Power and Conflict. The Handbook of Conflict Resolution: Theory and Practice, Jossey-Bas Publishers. San Francisco, USA.

Gardner, R., Ostrom, E., Walker, J.M., 1990. The nature of common-pool resource problems. Rationality and Society. Sage Publications.

Deutsche Stiftung Weltbevölkerung, 2012. Available at:

<http://www.weltbevoelkerung.de/home.html>. [ Accessed 22.04.13].

Fuller, B., 2009. Charter Cities. New York. Available at: <http://chartercities.org/blog/89/property-reform-in-peru>. [Accessed 23.09.13].

Fernandes, E., 2011. Regularization of Informal Settlements in Latin America. Lincoln Institute of Land policy. Cambridge, USA.

Fernández-Maldonado, A., 2006. Barriadas and elite in Lima, Peru: Recent trends of urban integration and disintegration. Recent trends of urban dis/integration in Lima 42nd ISoCaRP Congress.

Fernández-Maldonado, A. M., & Bredenoord, J., 2010. Progressive housing approaches in the

current Peruvian policies. *Habitat International*, 34(3), 342-350.

Flood, R., 2010. The Relationship of Systems Thinking to Action Research. *Syst Pract Action Res* (2010) 23:269–284. Springer Science+Business Media, LLC.

Follett, M. “Concept of power” in Pratt, S., 2011. *American Power: Mary Parker Follett and Michel Foucault. Foucault Studies*, No. 11, pp. 76-91. Oregon, USA. (Originally published in 1924).

Fox, J.A., and Brown, L.D., 1998, *The struggle for accountability: The World Bank, NGOs, and grassroots movements*, The MIT Press, Cambridge, MA.

Gaigl, K., 1982. *Lima- Metropole und Peripherie in einem Entwicklungsland. Fragenkreise*. 2. Auflage 1982. Paderborn, Deutschland.

Gardner, R., Ostrom, E. and Walker, J., 1990. The Nature of Common-Pool Re-source Problems. *Rationality and Society*, July 1990, 2, 335-58.

Gaventa, J., 1982. *Power and Powerlessness: Quiescence and Rebellion in an Appalachian Valley*. University of Illinois Press. USA.

Glenn, J., 2008. Informal formality: tenancies, ejidos and family land. *International Journal of Law in Context*. Volume 4, Issue 02, pp 135 – 148. Cambridge, UK.

Glossary of Environment Statistics, 1997. *Studies in Methods*, Series F, No. 67, United Nations, New York.

Hocker, J., Wilmot, W., 1985. *Interpersonal Conflict*. 2nd ed. rev. Dubuque, Iowa: Wm. C. Brown Publishers.

Hunjan, Pettit, 2011. *Power: A practical guide for facilitating social change; and The Partnering Toolbook* (2011, 4th Edition) Available at: <http://www.wageningenportals.nl/msp/tool/importance-against-influence-matrix>. [Accessed: 10.09.2013].

Instituto Nacional de Estadística y Informática del Perú (INEI), 2012. *Cambios Demográficos y*

Proyecciones De Población. Available at: <http://www.ceplan.gob.pe/documents/10157/4c87bd0e-0538-4588-bc22-583ddaeb7514>. [Accessed: 16.09.2013].

Instituto Nacional de Estadística e Informática del Perú (INEI), 2007. Perfil sociodemográfico de la provincia de Lima. [Accessed: 20.10.2013].

Ison, R. L., Maiteny, P. T., & Carr, S., 1997. Systems methodologies for sustainable natural resources research and development. *Agricultural Systems*, 55(2), 257-272.

Kelly, J. M., 2003. Counting on the Past or Investing in the Future? Economic and Political Accountability in Fujimori's Peru. *Journal of Politics*, 65: 864–880. doi: 10.1111/1468-2508.00216.

Kettering, S., 1988. The historical development of political clientelism. *The Journal of Interdisciplinary History*. Vol. 18, No .3. The MIT Press.

Kitschelt, H., 2000. Linkages between citizens and politicians in democratic politics. *Comparative Political Studies*. September 2000 vol. 33 no. 6-7 845-879. Sage Publications, Inc.

Kogetsidis, H., 2012. Critical Systems Thinking: A Creative Approach to Organizational Change. *Journal of Transnational Management*.

Kumasi, 2008. Situation Analysis. Institutional Analysis and Stakeholder Analysis. Wageningen International. Available at:  
<http://portals.wi.wur.nl/files/docs/File/MSDGhanaGuyana/Situation%20analysis%20stakeholder.pdf>. [Accessed 17.08.13].

Kurucu, Y., Christina, N., 2008. Monitoring the impacts of urbanization and industrialization on the agricultural land and environment of the Torbali, Izmir region, Turkey. *Environmental Monitoring and Assessment*. Volume 136, Issue 1-3 , pp 289-297. Springer Netherlands.

Lastarilla, C., Barnes, 1999. Formalizing Informality: The Praedial Registration System in Perú. LTC Research Paper 131. Land Tenure System. Wisconsin-Madison.

Lewicki, R.J., Tomlinson, E.C., 2003. Trust and Trust Building. Beyond Intractability: A Free Knowledge Base on More Constructive Approaches to Destructive Conflict. Available at:

[http://peopleedge.mindtouch.us/@api/deki/files/452/Trust\\_Building.pdf](http://peopleedge.mindtouch.us/@api/deki/files/452/Trust_Building.pdf). [Accessed 13.10.2013].

Lewicki, R.J, Wiethoff, C., 2000. Trust, Trust development and Trust repair. The handbook of conflict resolution: Theory and practice, 1(1), 86-107.

Lima Water, 2013. Sustainable Water and Wastewater Management in Urban Growth Centers coping with Climate Change - Concepts for Metropolitan Lima (Perú). Available at: <http://www.lima-water.de/index.html>. [Accessed 15.03.2013].

McElhinney, K., 2012. Auditing Water Resources for Application to Water-Sensitive Urban Design - A Case Study in the Lima (Perú) Metropolitan Area. University of Stuttgart.

Mcfarlane, C., 2012. Rethinking Informality: Politics, Crisis, and the City. Planning Theory & Practice, Vol. 13, No. 1, 89–108. Taylor and Francis. Durham, UK.

Mertins, G., 2009. Megacities in Lateinamerika: Informalität und Unsicherheit als zentrale Probleme von Governance und Steuerung. Institut für Technikfolgenabschätzung und Systemanalyse . Nr 1, 18. Jahrgang- Mai 2009. Universität Marburg, Deutschland.

Midgley, G., 2000. Systemic Intervention: Philosophy, Methodology and Practice. Kluwer Academic/ Plenum Publishers.

Moore, W., 1995. Action-Reaction or Rational Expectations? Reciprocity and the Domestic-International Conflict Nexus during the “Rhodesian Problem. The Journal of Conflict Resolution, Vol. 39.

Municipalidad Lima, 2013. Official webpage. Available at: <http://www.munlima.gob.pe/gerencia-de-desarrollo-urbano.html>. [Accessed 01.09.13].

Naughton, J., 1984. Soft Systems Methodology: An Introductory Guide. Block IV. The Soft Systems Guide. The Open University Press.

Ostrom, E., 2008. The Challenge of Common-Pool Resources, Environment: Science and Policy for Sustainable Development, 50:4, 8-21.

Ostrom, E., & Gardner, R., 1993. Coping with asymmetries in the commons: self-governing irrigation systems can work. *The Journal of Economic Perspectives*, 7(4), 93-112.

Pauchard, A., Et al ,2005. Multiple effects of urbanization on the biodiversity of developing countries: The case of a fast-growing metropolitan area (Concepcio´ n, Chile). *Biological Conservation* 127(2006)272–281. Elsevier.Ltd, Chile.

Peattle, L., 1990. Participation: a case study of how invaders organize, negotiate and interact with government in Lima, Peru. *Environment and Urbanization* 1990 2:19. SAGE. International Institute for Environment and Development. Available at: <http://eau.sagepub.com/content/2/1/19>.

San Martin de Porres, 2013. Official Webpage. Available at: <http://www.mdsmp.gob.pe/index.php>. [Accessed 07.10.13].

Saucedo, F., 2008. Tourist Climate. SENAMHI- Servicio Nacional de Meteorologia y Hidrologia Perú.

Schedler, A., Diamond, L., Plattner, M., 1999. *The Self-Restraining State*. Boulder, CO: Lynne Rienner.

Starn, O., 1995. Maoism in the Andes:The Communist Party of Peru- Shining Path and the Refusal of History. *J.Lat.Amer.Stud.*27, 399-421. Cambridge University Press.

Smolka, M., Biderman, C., 2011. *Housing Informality: an Economist's Perspective on Urban Planning*. Lincoln Institute of Land Policy.

SUNARP, 2013. Official Webpage. Available at: <http://www.sunarp.gob.pe/>. [Accessed: 19.07.2013].

United Nations Statistics Devision, 2013. Country profile- Perú. Available at: <http://data.un.org/CountryProfile.aspx?crName=PERU>. [Accessed 16.10.2013].

United Nations, 2012. *World Urbanization Prospects: The 2011 Revision*.

UN- Habitat, 2010. *State of the World's Cities 2010/11: Bridging the Urban Divide*. London:

Earthscan.

UN- Habitat, 2011. Cities and Climate Change. Global Report on Human Settlements. United Nations Settlement Programme.

Vigo, M., 2013. Lima, Peru. Next City. Available at: <http://nextcity.org/informalcity/city/lima>. [Accessed: 17.10.2013].

World Bank, 2013. Lima Running Dry – Promoting Water Culture in the Second Driest Capital of the World. Water and Sanitation Program. Available at: <http://www.wsp.org/featuresevents/features/lima-running-dry>. [Accessed: 17.10.2013].

World Bank, 1998. Project Appraisal Document. Report No: 29298, Peru. Urban Property Rights project, Washington D.C.

World Bank, 2006. Brazil Inputs for a Strategy for Cities: A Contribution with a Focus on Cities and Municipalities. Report 35749-BR. Vol. 1. Washington, DC.

World Bank, 2013. <http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD>. [Accessed 12.09.13].

Wilson, K., Morren, G.E.B., 1990. Systems Approaches for Improvement in Agriculture and Resource Management. Macmillan, New York (1990)

Wilmot, W. W., & Hocker, J. L., 2007. Interpersonal Conflict. Boston: McGraw-Hill.

Yiftachel, O., 2009. Theoretical Notes On 'Gray Cities': the Coming of Urban Apartheid?. *Planning Theory* 2009 8: 88. SAGE Publications, London, England.

Zanelli, 2013. Facilitating access to land property rights: Reform of land policies, institutions and norms in Peru. Habitat for Humanity. Available at: [http://www.habitat.org/lc/forum/english/goals/Facilitating\\_access.aspx](http://www.habitat.org/lc/forum/english/goals/Facilitating_access.aspx). [Accessed 17.07.13].

# Appendix

## Appendix 1: Interview questions

1. Que problemas hay con los canales de riego? What are the problems experienced with the channels?
2. Desde hace quando hay estos problemas? Since when do these problems occur?
3. Que opciones se examinaron para manejar los problemas? What possibilities were examined for managing the problems?
4. En su opinion que posibilidades existen para cambiar la situacion? In your opinion what possibilities exist for changing the current situation?
5. Quien es el propietario de los problemas? Who is owning the problem?