beware of the transaction costs!
- an assessment of transaction costs accruing for independent power producers in small-scale hydropower development in indonesia

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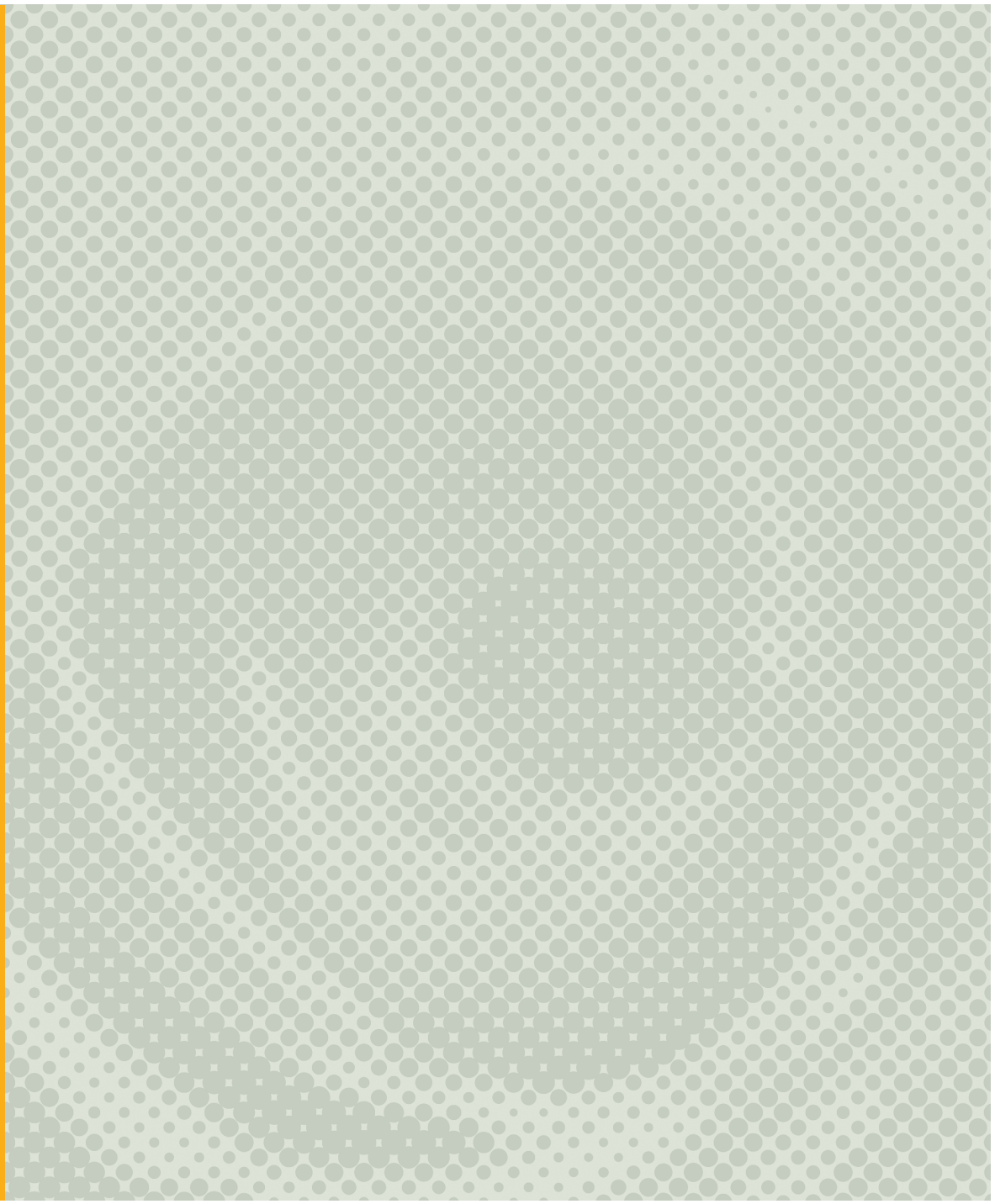

"Small is Beautiful?"

This thesis is a contribution to the wider research project "Small is Beautiful?" which aims to identify the barriers and needed qualities of small-scale renewable energy projects in making them beneficial both for economic and environmental reasons. The project is a joint cooperation between the Department of Economics and Resource Management (IØR) at the Norwegian University of Life Sciences (UMB), the independent research agency FNI, and Differ AS. The main financer is the Norwegian Research Council. The research process included a field trip to Jakarta in March/April 2011.

Two more students – Erlend Aas Guldbrandsen and Camilla Fulland – have been writing their theses' within the same project, focusing on the Indonesian electricity sector. The research process and field trip to Indonesia have been conducted in a fruitful collaboration, while the theses' have been written individually. All opinions expressed, and potential errors overseen in this thesis is the responsibility of the author alone.

Preface

Writing this thesis has been a rewarding task and an academic eye-opener regarding the many facets of economics and its societal impacts. Many people have been involved in this process, and I am grateful to all of you.

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Executive Summary

High transaction costs (TC), perceived or real, can have severe consequences for real life economic outcomes. For private investors, too high perceived transaction costs can lead to the exclusion of profitable investment alternatives. Possible reasons why such potentially profitable investments are excluded are that the real TC level is lower than assumed, or that the TCs are inadequately mapped, and could have been reduced if they had been identified and targeted. Too low budgeted TC, or not accounting for TC at all, can on the other hand lead to unexpected cost overruns and failed investments.

The core argument of this thesis is that where a large share of total project costs are not production costs, high TC occur and will affect economic outcomes. Where extensive TC occur, reductions potentials are large. A prerequisite for managing TC is to identify them. When known, more of the TC can be taken out of risk premiums incorporated in higher discount rates and required rates of return, and treated as explicit cost variables.

My aim is to shed light on the importance of treating TC beyond theoretical discussions. There does not yet, exist a commonly accepted definition of TC, nor a coherent methodology in how to incorporate TC in economic analysis. The theoretical framework applied in this thesis has taken form while trying to combine existing TC literature into a unified framework for treating TC more directly. The theoretical framework has been used to assess the particular TC accruing for foreign independent power producers in the Indonesian small-scale hydropower sector. The inherent context-dependency of TC make case studies like this important to reveal more about the causes and extent of TC. The emphasis will however be on findings that have relevance for TC and economic results more generally, and address the real-life consequences for small-scale renewable energy development in particular.

My findings support existing literature indicating that “extensive” TC often accrue for small scale investment projects in developing countries. In the hydropower case investigated in this thesis, I also found indications that the most extensive TC stem from costs associated with delayed project operation. Moreover, TC appears close to fixed. TC will therefore place a comparatively larger burden on small-scale hydropower projects, compared to larger projects in Indonesia.

Where extensive TC accrue, effective management of these costs can be used as a comparative advantage, possibly so influential that it explains the difference between the projects that realize profits, as in the case investigated, and the ones that fail.

Sammendrag

Høye transaksjonskostnader kan ha store konsekvenser for utfallet av investeringer. For private investorer kan oppfatningen om at transaksjonskostnadene er for høye føre til at lønnsomme investeringsmuligheter skrinlegges. Mulige årsaker til at lønnsomme investeringer aldri gjennomføres er at de reelle transaksjonskostnadene er lavere enn antatt, fordi transaksjonskostnadene er ukjente. Dersom disse var kartlagt kunne de ha blitt redusert. Budsjetteres det med for lave transaksjonskostnader, eller dersom transaksjonskostandene ikke inkluderes i planleggingen, kan uventede kostnader føre til budsjettsprekker og feilslåtte investeringer.

Kjerneargumentet i denne masteroppgaven er at for prosjekter der en stor andel av de totale prosjektkostnadene ikke er produksjonskostnader, er det naturlig å anta at transaksjonskostnadene vil påvirke det økonomiske utfallet. Der høye transaksjonskostnader påløper, er potensialet for å redusere disse stort. En forusetning for å kunne redusere transaksjonskostnader er å identifisere dem. Når transaksjonskostnadne er kjente, kan en større andel av disse flyttes fra risikopremiene som finnes i høye diskonteringsrater og påkrevde avkastningsrater, og behandles som eksplisitte kostnadsvariabler.

Mitt mål er å kaste lys over viktigheten av praktiske og anvendelige metoder for å behandle transaksjonskostnader. Det finnes p.d.d. ikke en allmengyldig definisjon av transaksjonskostnader, og heller ikke noen metode for å inkludere disse i økonomiske analyser. Det teoretiske rammeverket i denne oppgaven har tatt form gjennom et forsøk på samle eksisterende TC litteratur til et helhetlig rammerverk for TC håndtering. Dette rammeverket har blitt brukt for å vurdere de spesifikke transaksjonskostnadene som påløper for utenlandske, uavhengige kraftprodusenter i det indonesiske markedet for småskala vannkraftproduksjon. Transaksjonskostnader er kontekstavhengige, og case-studier som dette er viktige for å avdekke årsaker til- og utbredningen av transaksjonskostnader. Fokus er imidlertid, hovedsaklig på funn som har mer generell relevans for transaksjonskostnader og økonomiske resultater.

Mine funn støtter eksisterende litteratur som indikerer at høye transaksjonskostnader ofte påløper for småskala-investeringsprosjekter i utviklingsland. I tilfellet med vannkraft, som undersøkes i denne oppgaven, fant jeg også indikajsoner på at kostnader knyttet til forsinket produksjonsstart står for den største andelen transaksjonskostnader.

Transaksjonskostnadene fremstår som tilnærmet faste kostnader. Disse vil dermed utgjøre enstørre byrde for småskalaprosjekter, sammenliknet med større prosjekter i Indonesia. Der store transaksjonskostnader påløper kan effektiv håndtering av disse brukes som et komparativt fortrinn for en bedrift, muligens i så stor grad at det forklarer forskjellen på prosjekter som oppnår profitt og prosjekter som ikke lykkes.

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1. Introduction

The concept of transaction costs (TC) has received increased attention in the economic literature in recent years. Despite this, the TC term is still a source of discussion and confusion. The discussions and difficulties associated with defining and applying TC might explain why little research has been aimed at investigating the concrete drivers and extent of these costs. Dorward (2001) has criticized the lack of focus on microeconomic effects of TC. He has pointed out the highly relevant risk of TC methodology becoming solely trivial, tautological explanations for observed contractual behavior, rather than findings that can be used in real-life reduction of TC.

The inherent context-dependency of TC and high relevance for outcomes in real life economics calls for more investigation of TC in direct cases to reveal its usefulness beyond theoretical discussions. Much of the literature that *are* treating TC in real cases, end up categorizing the drivers for high TC in broad terms like for example "country specific TC" (E.g. Meyer 2001; Michaelowa et al. 2003). Due to the relative youth of the transaction costs literature, and lack of suitable methods to identify and quantify TC, the drivers behind the TC are often unknown and hence difficult to target for reduction measures. This thesis seeks to go deeper in identifying what lies behind TC by looking at the particular case of TC accruing for international independent power producers in the Indonesian small-scale hydropower sector.

Indonesia has a great and to a large extent unused potential for small-scale hydropower production. The hydrologic conditions are good, and the profitability potential for hydropower compared to other small-scale technologies make further development of small-scale hydropower seem like a promising pathway towards the stated objectives of the Indonesian electricity sector[1]. Despite the low pre-project estimates of the cost of small-scale hydro production, private investors have thus far not been eager to commit to this development (Fukuda and Siagian 2010; Arter *et al*. 2005; The World Bank/Bank Dunia 2009).

[1] The framework of future energy policy is centered on four main issues : *Diversification*: Reduce dependency on oil by expanding the use of coal, gas and renewable energy resources, 2) *Rational energy pricing*: Subsidies must be lowered or eliminated, 3) *Energy sector reform*: Decentralization of governmental decision-making and policies to attract investors and 4) *Rural electrification:* Most people without access to electricity live in rural areas.

A possible reason for the small volume of small-scale technologies being implemented in Indonesia and other developing countries seems to be the perceived high share of TC. Depending on the amount of TC, this can be crucial for whether small-scale hydro projects will be sufficiently profitable for investors. Empirical data suggests that small projects are less likely to be economically viable, especially because the TC per unit of production tends to be relatively higher than for larger projects.

To shed light on transaction costs in the Indonesian hydro sector, I will pursue three venues of research in the cost analysis. The cost analysis will start out with a summary of what I perceive to be the most relevant parts of the TC literature for the problem at hand. Second, I will go in more depth on TCs in the Indonesian hydro sector. Third, I will present a case using real data to make my analysis more concrete.

By taking an investors perspective, the analysis have similarities with project assessment perspectives and can possibly serve as an example on how to identify some of the costs hidden in the ”black box” of unexpected costs experienced by firms investing in emerging markets.

1.1. Objectives of the study and problem statement

The objective of this study is two-fold. First, it aims to shed light on the importance of treating transaction costs (TC) when analyzing costs of projects and to assess the link between transaction cost management and ex post economic results. Second, this thesis aims at obtaining a more in-depth understanding of the drivers behind high transaction costs, through exploring small-scale hydropower production in Indonesia as a case.

In this thesis I argue that TC are as real as production costs. Only if the origins of total costs (production costs *and* transaction costs) are known, adequate measures to reduce costs can be taken, and multiple benefits realized.

By applying the methodological framework of transaction cost from a private firm perspective, I seek to identify what lies behind transaction costs borne by foreign, independent power producers (IPPs) in small scale hydro projects in Indonesia. This perspective has broader relevance than the potential profits realized by the private actors. The Indonesian government is unable to mobilize sufficient financial resources to reach its electrification objectives[2]. Investment from private investors therefore will be crucial. Private actors will not invest unless they expect to generate sufficient profits. High, private-borne TC can therefore threaten the fulfillment of stated electricity targets and related benefits. Because of the extent of this thesis the main emphasis will be on *pre-project implementation transaction costs*, meaning the transaction costs accruing before production start.

The main problem statement of this thesis is therefore:

Identify the drivers behind the most extensive pre-project implementation transactions costs for foreign, private small-scale hydropower developers in Indonesia

[2] The framework of future energy policy is centered on four main issues : *Diversification*: Reduce dependency on oil by expanding the use of coal, gas and renewable energy resources, 2) *Rational energy pricing*: Subsidies must be lowered or eliminated, 3) *Energy sector reform*: Decentralization of governmental decision-making and policies to attract investors and 4) *Rural electrification:* Most people without access to electricity live in rural areas.

This thesis will combine different methodologies suggested in the transaction cost literature. The TC components analyzed will be operationalized in three categories based on a modified version of Dahlman's (1979) transaction costs categories:

1) Costs of information gathering
2) Costs of contracting
3) Costs of dealing with local constraints

More explicitly this entails answering the following research questions:

> *RQ1: What is the extent of the three categories of transaction costs (1 Information gathering, 2 Contracting, and 3 Local constraints) in the case investigated?*

From interviews in Indonesia it does not appear to be one single category of transaction that stands out as particularity large. Rather, the delays due to the many slow transactions become a big economic burden to IPPs. The second research question is therefore:

> *RQ2: Are there other types of transaction costs, like time delays, that also contribute to high TCs in the case investigated?*

The existing literature indicates that a large share of total TC tend to be fixed. This might also be relevant for the case investigated, and research question number three is therefore:

> *RQ3: Are the majority of transaction costs fixed or variable, and how does this affect the perspectives for small-scale hydropower development in Indonesia?*

TCs are expected to accrue and account for a bigger share of total costs when doing business in developing countries. Despite expected profitability in small-scale hydro projects when using standard project assessment excluding TCs, few international private participants find it beneficial to enter this market. At the same time, some few hydro developers are experiencing good profits where others hesitate to enter.

> *RQ4: Is effective transaction cost management a determinant for whether small-scale hydro power production becomes profitable for independent power producers in Indonesia?*

1.2. Structure of the thesis

Part two of this thesis starts out with a general theoretical approach to transaction costs, where major discussion points are treated and the choice of definition for this thesis is outlined. Part three is treating transaction cost methodology. Due to the unsettled academic consensus and relative little prior research done on applying transaction costs methodology on direct cases, the methodological approach of the thesis will therefore be somewhat probing in nature; testing different approaches suggested as transaction cost methodology when seeking to answer the research questions.

The theoretical discussion of transaction costs and the proceedings in the methodology are intended to be a small contribution in filling the much needed gap of a more coherent and context-independent approach to transaction costs. Transaction costs experienced in real-life projects depend however upon prevailing, context specific circumstances and research results will vary with the cases investigated. For this thesis the theoretical and methodological framework will be used to investigate the specific transaction costs borne by foreign, independent power producers in the area of small-scale hydropower production in Indonesia. Part four of this thesis is a case study analyzing transaction costs issues facing independent power producers in small scale hydropower production in Indonesia. That part starts out with a description of the Indonesian energy sector, focusing on potential benefits realized through developing small-scale electricity production and areas of the institutional structure that appear most relevant in causing TCs. TC components are chosen, based on existing literature and field research in Indonesia. Where quantitative data is available, these have been used to say something about the expected TCs accruing for each driver.

The findings from part four will be complemented with a specific case study in part five. The same methodological framework as in part four is applied to investigate the TCs borne by *one* specific foreign, IPP in small-scale hydropower production in Indonesia.

Part six is a discussion over the application of theory and methodology based on the findings from the case study. The findings will be used to suggest towards potential TC reduction.

In the final section I conclude and point to future work needed to gain a more comprehensive understandig of the role of TC in small-scale hydro power in Indonesia, and comment more generally on small scale technology investments in a developing country perspective.
A list of abbreviations can be found at the end.

2. Theory

2.1. Transaction costs

The concept of transaction costs (TC) is used in various ways in economic literature. The term was first introduced in Coase's 1937 paper "The Nature of the Firm", meaning the cost of using the price mechanism. The TC term is the source of a lot of discussion and confusion. TCs may mean solely the cost of market exchange, it can include or exclude transport costs, and it can be used as the strict category of information costs or the cost of time. Measures of TCs include monetary terms, departure from a perceived first-best outcome, or as the framework for qualitative comparative rankings of institutional alternatives (Klaes 2001).

The TC concept has been most widely (but not exclusively) examined within the economic branch of "New Institutional Economics" (NIE). Despite many variations within the tradition, most NIE researchers accept the conventional use of marginalism, and acknowledge its usefulness. The main focus, though, is on aspects of the economic system that are often neglected in conventional economic theory, such as the role of TCs (Furubotn and Richter 1991). The branch of NIE studying TC is often termed transaction cost economics (TCE). Oliver Williamson has been the main frontrunner of this branch. Neo-classical theory and TCE are more complementary than competitive approaches. Williamson (2005) argues that where conventional neo-classical theory is better for aggregation in simple macro perspective exchange, TCE is more suited when analyzing complex contracting in specific complex markets of institutional frameworks.

2.1.1. Defining Transaction costs

Despite the voluminous literature in the new institutional economics, there is not yet a theoretical consensus on what transaction costs are (Wang 2003). Williamson has done some extensive work on trying to create a coherent theory and methodology for treating transaction costs. He describes transaction costs as "*the economic counterpart of friction*" (Williamson 1981:552). This is line with Coase´s definition of TCs as the costs that arise additional to production costs. Production costs can be defined as all costs related to the production chain, whilst transaction costs are all other costs accruing in coordinating the different links of the production chain (Butter 2010). Throughout this thesis transaction costs will be defined in the same manner: *Transaction costs are all other costs than production costs.*

2.1.2 Optimal allocation with transaction costs

Conventional price theory assumes zero transaction costs. This does not mean that the existence of some "system costs" is denied, but they are not included as exogenous nor endogenous variables in the theoretical models (Furubotn and Richter 2000). Because data, documenting transaction costs normally are not easily available, often only prices are used in investment analysis and transaction costs are frequently excluded. A common way to include TC indirectly is by incorporating the potential costs as a risk premium in a higher discount rate. "Hiding risk" in the discount rate makes the investment analysis less transparent, which could be unfortunate, in particular if TCs are large. Whenever TCs appear to constitute a substantial component to costs, which more often is the case so in developing countries, investment analysis neglecting or not making TCs visible can easily be flawed.

Optimum is according to basic economic theory found where the supply function and demand function intersect and dead weight losses are minimized. I argue that some TCs will always accrue, and optimum is reached where these are included in cost functions and minimized.

This point is better illustrated in Figure 2.1. As TCs are real, the optimal allocation includes transaction costs when minimized, and failure to include transaction costs lead to a dead weight loss.

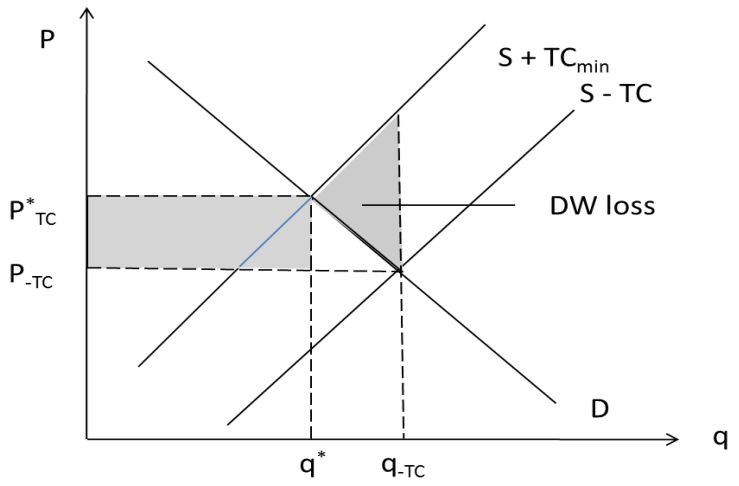

Figure 2.1: The impact of neglecting transaction costs

S+TCmin denote supply with the economically feasible TC.

S-TC denote supply when TC erroneously have been neglected.

The difference in allocation q^* and q_{-TC} in figure 2.1 illustrates how the optimal distribution of price and quantity will differ depending on whether (minimized) TC are included in the cost function or not.

It is in my opinion better to include TCs alongside "regular costs", as much as possible, to reach optimum. Otherwise investments decisions will from the beginning be based on incomplete information. If TCs are zero, the equilibrium prices and quantities with and without TCs are the same. i.e.,$(p^*, q^*) = (p^{-TC}, q^{-TC})$.

If positive TCs are accepted and cost minimization is assumed, it is desirable to minimize the sum of costs, both production costs and transaction costs. From an investors perspective the optimal allocation will be the investment alternative that incurs the lowest sum of bundled production costs and transaction costs.

2.1.3 TC and net present value (NPV)

Private investors will not invest unless the expected net present value (NPV) of a project is positive for the investor specific requirement to rate of return. The NPV is a measurement of the investments cost, operational cost and cash inflows throughout the lifetime of the project. The value of the investment equals the value of its future cash flows, discounted to present value terms. When choosing between alternative projects, the projects with the highest NPV should be chosen, because this is the project that will increase the shareholder wealth the most. The decision of whether or not to invest in a particular project depends upon whether the expected rate of return is larger than the investor determined minimum rate of return. Which discount rate should be used is not straightforward. Several principle exist: it can be either similar to the relevant market rate or the weighted average cost of capital method (WACC), or be set by the investor to match his or her required rate of return on capital. A discussion between the various methods is not directly relevant for my work and will not be pursued further in this thesis.

A more relevant matter is the debate over how much the discount rate and internal rate of return (IRR) should be determined by the risk-level of the project. Both discount rates and the required IRR are normally higher for investments in countries and markets with higher risk. A risk premium is added to the risk free discount rate to account for the uncertainty of cash inflows and outflows. This thesis argues that TC should be included in the NPV alongside other costs as far as possible instead of being stuffed into discount rate or higher required rate

of return. The more that is known about the costs arising in addition to capital and production costs, the easier they can be both measured and potentially reduced. This point will be pursued further in the discussion in part six.

When including ex-ante TCs as explicit costs alongside other costs, a NPV formula for a project developer could look like this:

$$NPV = \underbrace{-I + \sum_{t=t_0}^{t_{COD}} \beta^t \, TC_t}_{\textit{Before COD}} + \underbrace{\sum_{t=t_{COD}}^{T} \beta^t (B_t - C_t)}_{\textit{Beyond COD}} \qquad (2.1)$$

Notes: COD: Commercial Operation Date

In equation (2.1) I is initial investment including production and capital costs, t_0 is time of project start, t_{COD} is the time of commercial operation date, β^t is the discount factor[3], TC_t are the transaction costs that will accrue ex-ante commercial operation date, B_t is the sum of project benefits in period t, and C_t is the total project costs in period t.

The variables most relevant for this thesis are denoted in red in equation 2.1 and subsequent equations. Except the cost component TC_t, the other cost components in the NPV analysis are standard project analysis components. The focus of this thesis is the extent of TC, and the other cost components will not be explored further. Despite this, it is important to keep the broader profitability in mind because the extent of TC will affect the overall NPV of small-scale hydro projects and the optimal allocation requires minimization of both production and transaction costs. This is important because the private investor will prefer the project alternative expected to generate the highest NPV, independent on which of the costs make up the biggest share of costs. A project can therefore be preferred despite having high TC, if the other costs are low or the benefits sufficiently high compared to the size of the investment, and vica versa.

The extent of TC depends upon both the *amount of TC* accruing before commercial operation date and the *effect on NPV due to delayed* t_{COD}. Continuous TC are likely to accrue also after commercial operation date and will affect C_t. Due to the focus of this thesis on treating pre-

[3] $\beta^t = \frac{1}{(1+r)^t}$ where r is the private discount rate chosen by the investor.

project implementation TC, the effects of continuous TC occurring after COD will not be pursued further.

One reason why TC is normally not included as an explicit cost component is the uncertainty associated with these costs. The formula above depicts the true values of the cost component and the associated NPV. In real life the variable TC_t is not known before the time of COD. To incorporate this variable in a real life ex-ante project analysis; estimates will have to be used:

$$NPV = \underbrace{-I + \sum_{t=t_0}^{\widehat{t_{COD}}} \beta^t \, \widehat{TC_t}}_{\textit{Before COD}} + \underbrace{\sum_{t=\widehat{t_{cod}}}^{T} \beta^t (B_t - C_t)}_{\textit{Beyond COD}} \qquad (2.2)$$

In equation 2.2 the values for $\widehat{TC_t}$ and $\widehat{t_{cod}}$ will have to be found by looking at country-specific factors that are expected to incur costs, for example by identifying possible cost drivers within the three TC-categories applied in this thesis: Costs of information gathering, of contracting, and of dealing with local constraints.

At first glance it might appear strange to use estimates also for $t_{COD.}$ I have chosen this formulation because the findings, which will be presented in the case study, indicate that where high transaction costs accrue, there is also more uncertainty about the time of COD. A delayed COD as a consequence of transactions taking longer than predicted can make up an extensive part of the TC. Reducing the time spent on transactions before COD can therefore possibly be one way to reduce high TC. Figure 2.2 and figure 2.3 give a stylized illustration of this cost reduction potential.

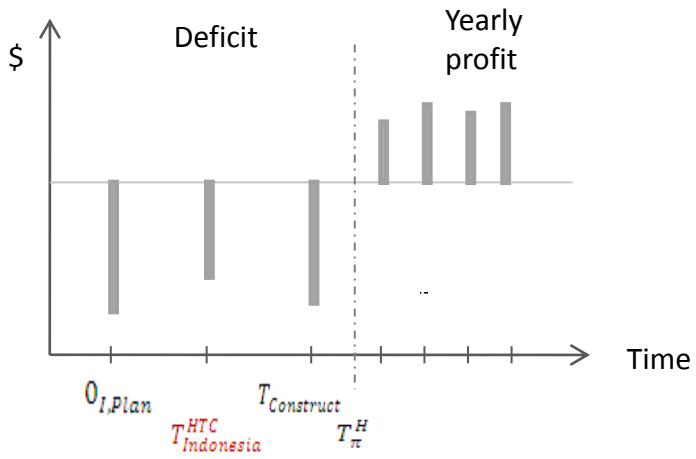

Figure 2.2: Deficit and profit with high transaction costs

Notes: HTC: High transaction costs.

Figure 2.2 shows that if TCs are high and delay the project, this will increase the time before profits can be realized and reduce yearly profits. If making transactions are assumed to be too time consuming, it is likely to scare away private investors.

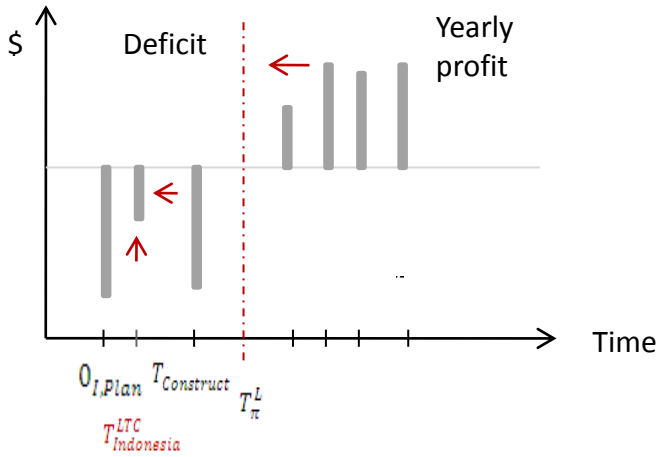

Figure 2.3: Deficit and profit with reduced transaction costs

Notes: LTC: Low transaction costs

The change in figure 2.2., compared to figure 2.3. illustrates the effects on profits by reduced TC, both by reduced amount and time spent, which will of course also reduce amount spent. If the project can be realized faster (due to less time spent on pre-project implementation transactions) and for a lower cost (reduced explicit costs spent on transactions), profits can be realized earlier and be higher. Further, pushing the COD closer to project startup will increase the value of the net benefits accruing from COD and onwards to terminal time, due to the fact

that the net benefits will occur closer to t_0, a timing effect that will somewhat reduce the discounting of the net benefits. But in order to reduce transaction costs, knowledge of the drivers and extent of the different transaction costs is inevitable.

The most obvious impact of TC is that they raise the costs for the participants of the transaction, and thereby lower the trading volume or prevent transactions from occurring in the first place. Transaction costs can accrue to different participants, both governments and private actors. Because most research on TC is focused on theoretical aspects associated with public projects, private transaction costs are not so often focused upon (Groth 2008). This does not mean that private firms are not experiencing TC. Companies have to bear internal TC due to project development and management, and through interaction with other companies and with government representatives. For an overview of literature see Wang (2003).

For private investors or project developers, the performance of the total activities related to an investment or policy implementation is important because the implementation of decisions is not costless, and the costs that accrue will normally reduce the portfolio returns (D´Hont and Giraud 2008). Optimal portfolio management will therefore have to include transaction cost management.

2.1.4 Transaction cost management

Butter (2010) has made a convincing argument for the economic value of focusing on, and actively managing transaction costs. He describes the ability and skill to keep transaction costs low as a major determinant of a firm's competitiveness. Similarly Solnik and McLeavey (2004) argue that transaction cost should be a key consideration, and included in portfolio management, seeing as TCs often make a substantial part of total costs. This is particularly important in emerging markets where TCs normally are more extensive.

According to classic economic theory, the availability of raw materials and cost of labor is assumed to determine what is produced where. However, Butter (ibid.) claims that these variables only partially explain the patterns of international trade. He argues that if all comparative advantages where completely exploited, total world trade flows would be much greater than they are today. The reason why they are not, and why transaction cost management is important is that trade and production in itself brings a variety of extensive costs: transaction costs.

Butter (ibid.:2) defines transaction cost management as: "*the ability to keep the costs of trade transactions as low as possible so that the value creation from these transactions is optimized*". He argues that TCs will always accrue as a more or less extensive part of total costs, and that value can be created from transactions by lowering TCs as much as possible. To be able to conduct effective transaction cost management, a firm must not only specialize in production, but specialize in making transactions costs as low as possible to become profitable. In transaction cost management the field on institutional economics is therefore connected to trade theory. Due to the many fields that are touched upon, transaction cost management is a challenging task. Because transaction costs are so difficult to quantify, other skills than strict economic assessments will be necessary. As Butter describes it: "*a good business sense is needed to estimate their* (TCs) *sizes and, as much as possible to avoid them,* (and they) *will become an increasingly important part of the total costs of economic activities"* (Ibid.:8).

The most evident problem with TCs is that they are more difficult to identify than production costs because they accrue due to complex institutional barriers. This does in my opinion, not exclude the potential to identify at least some of the most important drivers for TCs. If a proportion of TC is known, measures can be taken to reduce these costs, and the cost function will shift inwards, similar to any other cost minimizing effort.

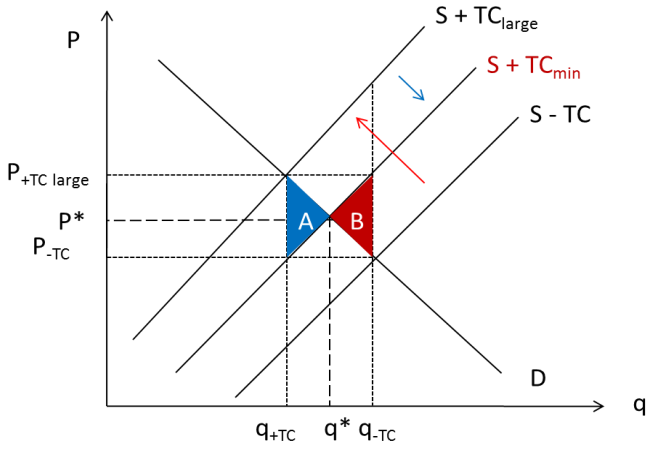

Figure 2.4 The impact on resource allocation and deadweight losses from excessive or neglected TC

Note: TClarge: excessive transaction costs, -TC:neglected transaction costs

Figure 2.4 shows how dead weight losses can be reduced if TC are included and minimized (S + TC_{min}). S+ TC_{min} illustrates the supply curve you get from minimizing TC, and which consequently defines the distribution of price and quantity distribution in the market. Triangle B illustrates the dead weight-losses from not including TCs that are real. Triangle A illustrates the dead weight-losses from not having minimized TC. TC management will be required to reach optima (*q**). TC management can therefore be described as two two-stepped action-plan, which will have to be done in a prioritized order:

Step one: Map which TC are likely to occur/have occurred for the particular investment context.
Step two: Take measures to reduce the costs identified in step one.

Step one entails moving from S-TC to S+ $TC_{large.}$ (red arrow). This shift will eliminate DWL equal to triangle B, but create a new DWL equal to triangle A. You then move from a situation of producing too much (q_{-TC}), to a situation where you produce too little (q_{+TC}).This means that before measures to reduce TC above S + TC_{min} are taken (blue arrow), total DWL will not necessarily be reduced compared to your starting point (S-TC), depending on which triangle is the largest.

According to classic price theory, it will be rational to take measures to reduce the DW loss, if the costs of doing so are less than the costs of the DW loss itself. When the DW loss is big, the potential cost savings from reducing TC are large. Possibly, many of these TC are readily observed and easy to fix, i.e. the equivalent of picking "low hanging fruits". The low hanging fruits will naturally be the components that cause the largest amount of TC, or the TC-drivers that are the easiest (cheapest) to identify *and* target for reduction.

Because of the enormous amount of possible variables inherent in the concept of TC, a throughout quantification of all TC is neither possible nor desirable. The conflict lies in finding the right balance between precision and TC. To get "sufficient" information about these institutions is neither costless nor symmetric. What can be said to be the "sufficient" level is another problem. Information is not costless, and finding the right balance between precision (demanding high TC) and less precision (lower TC, but potentially bigger losses from information deficit) is difficult to determine.

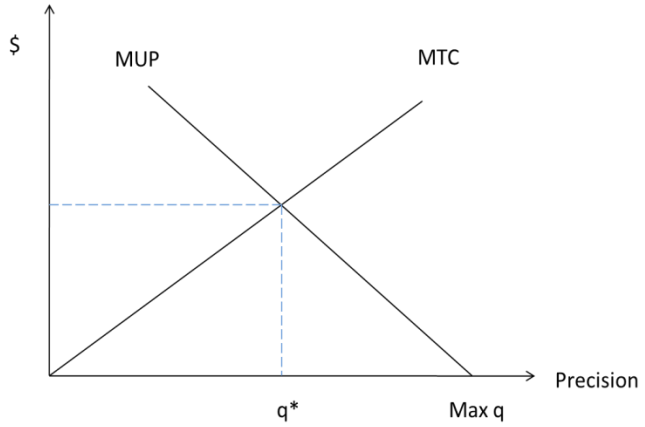

Figure 2.5: The trade-off between transaction costs and precision

Notes: MUP = marginal utility of increased precision, MTC = marginal TC.
(After Vatn 2005).

Increasing precision is naturally the aim of most investment strategies, but this comes with a cost. Maximum precision, Max q, is therefore normally not the optimal level (Vatn 2001). This involves accepting that the best level of information is somewhere between no information at all, and perfect information. In situations where high shares of total costs are not production- or capital costs, saying that high amounts of TC accrue, it seems rational to seek more information about the drivers behind these costs, to make it possible to reduce these costs. The task is to find the alternative that maximizes particular expected profit of the investigation cost *(q** in figure 2.6). This will, as argued by Butter (2010), have to be done through a combination of analyzing quantified and non-quantified data as part of the transaction cost management.

2.1.5 Fixed transaction costs and small-scale projects

Transaction cost can be either fixed or variable. The extent of both kinds can influence the attractiveness for private investors depending on how much the share of TC contributes to total project costs. Fixed TCs are independent of project size, and thus, the smaller the project the greater impact of fixed TC.

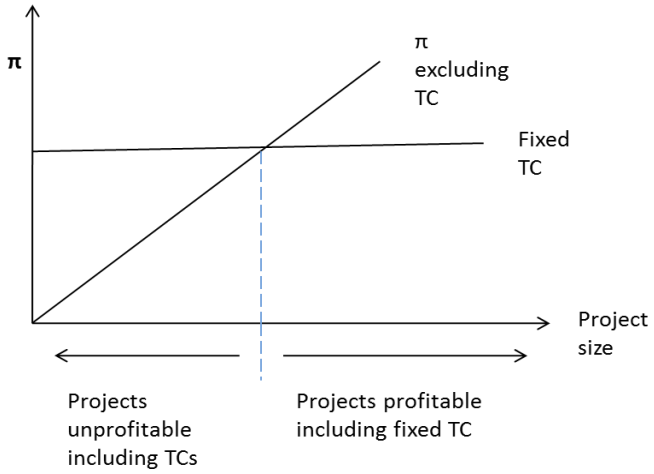

Figure 2.6: Project size and the impact of fixed transaction costs

(After Rørstad *et al*. 2008).

As is evident from figure 2.6, profitability will depend upon the cost level (including TC). The stapled vertical line indicates the threshold for the size of projects when assuming profitability criteria. The realization of small-scale projects will therefore be closely linked to the amount of fixed TC.

2.1.6 The structural production frontier

In treating TC, North (1981) uses the concepts of *technical production frontier* and *structural production frontier.* The concepts are helpful to understand transaction costs, as well as a good starting point when seeking to identify drivers for high TC. The technical production frontier in a country is the sum of all available knowledge and resources, which makes up the upper limit for production capacity. The structural production frontier is the existing institutional structure that affects the choices for costs minimization and output maximization of this capacity. Economic organization is affected by the institutional structure in place, which again is determined by the political structure. Different political systems create different incentives that can make it easier or more difficult to make the structural production frontier get closer to the technical production frontier.

Both for a government and for private investors, higher TC will occur when the existing institutional structure makes it difficult to get closer to the technical production frontier. Dealing with these difficulties is the friction of the economic system that causes transaction

costs, both for private investors and for the government in trying to maximize either social welfare or economic profit. The form of this friction is context dependent and might take substantially different forms in developed and developing countries and across these broad categories. Jarvis (2010) argues that country-specific institutional-regulatory contexts in developing countries produce different kinds of regulatory risks than those in developed countries, which again have severe effects for both state interest and private sector participants. Michaelowa (2003) describes TC levels in developing countries as higher than in developed countries due to often less efficient political and judicial institutions

The measures to reduce friction therefore much depend on country specific knowledge. The country specific features that raise transaction costs will be further elaborated in the case study in parts four and five.

2.2 Problems when including transaction costs

As stated earlier, there is no consensus on the definition of transaction costs (Dorward 2001; Wang 2003). The result of this is that the different studies include slightly different elements when defining transaction costs and that the estimated transaction costs are not directly comparable between the different studies. A related problem I will emphasize further in the next section is that since TC are highly context dependent, operationalization and measures of TC will have to be mainly based on empirical case studies. To date such studies are few.

Another problem in trying to estimate for TCs more explicitly for use in ex-ante project implementation (making TC_t from the NPV (equation 2.1) an explicit cost variable), is again related to the difficulties of agreeing upon a definition and operationalization of TC, and the troublesome measurement of TC. Despite being challenging it does not seem impossible. If the first investment in a new country and/or sector is considered not solely a single investment that should generate a given rate of return, but considered part of a larger investment strategy, the first investment can serve as a "pilot". For following investments in similar context, more will be known about the form and extent of TC and which measures can be taken to reduce them. If as much TC as possible are detected, these findings can reveal if the level of TC is higher, lower or equal to the one estimated beforehand. These findings can be used to ensure that the adjustment for the next project will approach $S + TC_{min}$ (figure 2.4). This point will be further elaborated in part 7 after having presented the case study findings.

Despite the many problems faced when trying to incorporate TC in the analysis of the small-scale hydro production in Indonesia, there are also potentially large gains in doing so in terms of increased understanding of the problem. If some of the drivers causing uncertainty about non-production costs are identified, it is possible that more small-scale hydro projects will be realized in Indonesia, and following environmental, social and economic benefits obtained.

To include TC in investment bases or policy bases does not have to be a question of "all- or -nothing", meaning that all drivers for TC have to be known, before TC reductions can be realized. When large TC exists, there is a potential for picking the "low hanging fruits" of targeting the most evident and most influential TC. Exactly where to start looking for the low hanging fruits in Indonesia will be treated in the following methodology section.

3 Methodology and Data

3.1 Transaction costs Methodology

Incorporating transaction costs complicates an analysis and might explain the relative small interest to do so in the economic literature. According to Williamson, *"Institutions and organizations matter for economic results. One reason why this message took a long time to register is that it is much easier to say that organizations matter than it is to show how and why"* (Williamson 2002:171).

The interest in TC is increasing in a variety of fields and within different parts of the economic literature. Much of the existing transaction cost methodology has been directed towards proving that transaction costs matter (Knack and Keefer 1995; the World Bank 2003). What is measured in these, and similar work is therefore the *existence* of TC, but not direct drivers or extent of TC.

Within financial economics, the definition of TC is narrower than within the Williamson tradition. TC is generally understood, and agreed upon as being the costs deriving from investment in financial markets. TCs are divided into two categories of *brokerage fees* and *ask-bid spreads* (Wang 2003). Within this perspective, empirical studies are more frequent. A possible reason for a broader interest in empirical TC studies in finance appears to be the easy accessibility to data and general agreement upon the definition.

When broadening the definition of TC, like the one applied in this thesis, the number of variables increases and access to relevant and measurable data becomes a hindrance. This might be part of the reason why attempts to do empirical studies of drivers for TC are few.

To get as close as possible to the $S+TC_{min}$ (figure 2.5), a combination of the two approaches discussed can seem helpful. This entails agreeing upon a definition of TC and to develop categories for transaction cost components that can be documented and compared to other contexts. The methodological choices for this thesis will be explained in the following section.

3.2 Methodological choices

McCann *et al*. (2005) lists four possible methods for collection of data about TC, that are often referred to as the transaction cost methodology: (1) Surveys or interviews of governmental personnel and stakeholders, (2) Government reports, (3) Financial reports and (4) Proposed budgets. The transaction cost methodology hence, includes both using existing data and literature and empirical case studies.

I will use a combination of the different methods suggested by McCann (ibid.) in an experimental approach to uncover TC. I will use existing literature to narrow down the number of potential TC drivers, and extend the insight in drivers by information gathered directly from relevant actors in Indonesia. These results will be compared with the perceived transaction costs experienced by one particular IPP in small-scale hydropower production in Indonesia. The transaction cost issues will therefore be results derived from existing literature, as well as my own and others' empirical studies.

Dahlman's (1979) definition of TC seems to be a useful starting point for a general way to operationalize TC, by dividing them into three categories: (1) *The cost of gathering information*, (2) *the cost of contracting* and (3) *the cost of control*. The methodology in this thesis is based on an established classification because it will be important to build on existing theory within the TC literature to contribute to a more coherent understanding of TC. Despite this, I have chosen to replaced Dahlman´s (ibid.) third category (Cost of control) with 3) the cost *of dealing with local constraint,* because my research indicates that adapting to other country specific variables contribute to a big share of TC for small-scale hydro developers. I have chosen to replace "the cost of control" as one core cost drivers since these costs are not expected to be as substantial in situations where transactions regard well defined commodities (such as power) because existing control mechanisms are established as part of the private contracts (Rørstad et al. 2008). The cost of control will be of greater importance when investigating less established goods, such as the value of carbon, when for example exploring further the CDM aspect of small-scale hydro power production.

Having operationalized TC, the challenge of defining relevant variables under each parameter still remains. I have chosen to include the variables that appear most pressing, based on previous studies and interviews with stakeholders in Indonesia.

An additional parameter of transaction costs related to CDM will be touched upon briefly in the cost analysis.

McCann and Easter (1999) have done an extensive study to measure the magnitude of transaction costs associated with pollution reduction policies. In their study they measured the labor input required and translated it to monetary terms. I will use a similar, but less comprehensive approach in this paper, as applicable quantitative data has proven difficult to obtain. This thesis mainly investigates the components causing the most extensive delays. At each stage between the decision to investigate project opportunities and the start of execution (production or policy), there are potential delays that can negatively affect the total return, or even the existence of projects. Transaction costs therefore depend much on how rapidly production can be started. Time spent on each of the three categories (Information gathering, contracting and dealing with local constraints) will therefore be crucial for the final rate of return and expected rate of return for potential new project developers.

3.3 Data

Data sources will be a combination of literature peer-review, existing surveys, interviews with relevant actors involved in small-scale renewable energy development in Indonesia and a case study of a foreign independent power producer (IPP) in small-scale hydropower development in Indonesia.

3.3.1 Existing data

The transaction cost components are chosen in line with existing literature on assumed drivers for transaction costs and associated country specific features in Indonesia. Data is collected from existing articles, country reports and data sets.

3.3.2 Interviews

Because of the context-dependency of transaction costs, the author has conducted interviews in Indonesia to get first-hand impression of components perceived to be the most extensive causing transaction costs. The respondents consist of project developers, government officials, NGOs and others that have special knowledge about the small-scale hydro power field in Indonesia (Appendix 1). A total of 16 interviews were conducted. These interviews were performed in a semi-structural manner, and conducted in cooperation with two other students investigating other potential barriers for small scale renewable energy production in

Indonesia. All three students took notes, and the data used have been cross checked between the three interviewers. There was no time limit for the interviews, which lasted between 45 and 120 minutes each. The respondents were informed about the purpose of interviews. Direct statements are presented with name, title, institution, location and date. The main purpose of the interviews was to grasp the most obvious drivers of TC. Because of the relatively small number of interviews conducted, the respondents were asked to recommend literature that could support their statements. Statements are only used as a direct source where written sources do not exist.

One relevant problem when using interviews in TC methodology, emphasized by McCann et al. (2005), is that informants might not have full knowledge of TC and results can be less reliable. The advantage though, is that interviews include the perception respondents have on TC, and can provide additional relevant information. The perception of TC might be as important as the actual TC that will accrue in small-scale hydro extension because this perception can affect the decision over wither to invest in small-scale hydro or not.

One major problem experienced during the interviews, was that different stakeholders had different perceptions about the meaning of transaction costs, and the answers could not always be compared because of this difficulty. The results are therefore not a throughout documentation of the extent of TC, but a documented assumption of where to start looking for the most extensive TCs for IPPs involved in small-scale hydropower production.

3.3.3 Independent Power Producer view – mini case study

In February 2010, The Norwegian/Indonesian company *PT. Sulawesi Mini Hydro Power* started their first small-scale hydropower project, Manipi HEPP, in Sulawesi, Indonesia. The experience of *PT. Sulawesi Mini Hydro Power* will be used to draw some more in-depth knowledge on the extent of various TCs, focusing on the period before production start-up. Data from the case include company reports and interviews with project manager.

3.4 Limitations of my thesis

My research has some obvious limitations. First, the existing data, and especially quantified data relevant for TCs, is limited. Second, the fieldwork was relative short, due to the limited timeframe of this thesis. I also see my own limitations as a master's student, trying to navigate within the emerging field of transaction cost theory and methodology. Despite this, I believe

that attempts to do empirical research on TCs are important to prove its significance beyond theoretical use.

It is obvious from the previous discussions on TC theory and methodology that many unknown TCs will occur, and obtaining full information on all drivers will neither be possible nor preferable. Despite this, this thesis argues that as long as the expected potential gains from reducing some TC are bigger than the actual costs of the TC in discussion, the search for TC drivers to be reduced is worthwhile. Because small scale hydro is profitable in some countries and some project developers have succeeded in developing small-scale hydro projects in Indonesia, it seems likely that there is a potential for reducing TC and increase profitability. My approach has been to look for the most obvious drivers for TCs based on an empirical study of the framework for small-scale hydropower production in Indonesia.

4 Case study: Private borne transaction costs in small-scale hydropower development in Indonesia

This case study seeks to reveal the factors that are likely to create friction when developing or planning to develop small-scale hydro projects in Indonesia, and hence cause high transaction costs. This part can be seen as the first step of transaction cost management. Because this thesis analyzes the small scale hydro power sector in Indonesia as a whole, the findings will be less accurate than if *step one* (mapping transaction costs) was done for one particular investor within this sector.

In the search for the drivers behind the most extensive transaction costs facing independent power producers in small-scale hydropower development in Indonesia, some knowledge about the institutions that affect the structural production frontier, and hence affect the amount of TCs, is crucial. Chapter 4.1 is an overview of the Indonesian electricity sector. The focus is on benefits realized through developing small-scale hydropower projects and factors that are likely to affect the extent of TCs in doing so.

4.1 Background case study

Indonesia is experiencing a steady and substantial economic growth and has a broad range of resources for power generation. Despite this, Indonesia faces severe challenges in the energy sector. One third of the Indonesian people live without access to electricity. 80 percent of those not having access to electricity live in rural areas. Indonesia´s primary energy demand is projected to grow by 2.4% per year through 2030. The energy base heavily depends on fossil energy sources, such as oil and coal. A steady growth in energy demand and dependence on fossil fuels is expected to make Indonesia the world's third largest emitter of greenhouse gases (Bank Dunia/The World Bank 2005). To reduce these emissions, it is paramount that at least parts of the new capacity needed to supply the increasing demand should be from renewable energy sources.

4.2 Electricity sector organization

Electricity generation and transmission are operated by the state-owned monopolist, The National Electric Power Company (*Perusahaan Umum Lisktrik Negara*, hereafter PLN), which is the country´s single largest electricity supplier. Distribution is locally monopolized.

For capacities up to 50MW, the regional units have the planning and approval authority. For larger capacities PLN centrally has the authority (Nikomborirak and Manachotphong 2007).

One core aspect of the energy sector and main barrier to renewable energy production is comprehensive fuel- and electricity subsidy and social tariff system[4]. Despite the acknowledgement of an urgent need to decrease subsidies, numerous attempts have been postponed. There is a massive resistance towards removal of the subsidies among both households and business. The relationship between subsidy decrease and the public interest has proven to be one of the most difficult aspects of electricity sector reform (NN (pers. Mess))[5].

4.2.1 Independent Power Producers (IPPs)

PLN´s inability to secure sufficient power supply has led to many attempts of trying to reform the energy sector. Crucial aspects have been to reduce subsidies, decentralize authority and open up for privatization and independent power producers (IPPs). The first IPP contract was given in 1990. In the period 1994 to 1997, another 25 contracts were signed. The introduction of IPPs led to a shift from shortage to overcapacity in the Java-Bali region, but did little to improve rural electrification rates. Contracts were usually granted to those who had connections to the President's family, and the corruption level is described as "staggering" (Seymour and Sari 2002).

In mid 1997, the Asian financial crisis reached Indonesia. It hit PLN and the energy sector hard. PLN went from average tariff revenue of cost-recovery before the crisis to being unable to cover costs by the end of the crisis. International investors withdrew from power projects, and the problem was further accentuated because all IPPs were contracted with adjustment formulas for exchange rate variations. The collapse of the national currency bankrupted PLN, and led to chaos among actors in the Indonesian power sector (Pintz and Korn 2005).

Indonesia has to a large extent regained financial stability after the Asian financial crisis, and electricity consumption has grown substantially. The political climate is also more liberal after the institutionalization of democracy in 2000 (Purra 2010). Still, many economic challenges remain, like high unemployment, a weak banking sector, widespread corruption,

[4] For further detail about the Indonesian elictricity sector, see Purra (2010)
[5] Sari 2011 (Appendix I)

poorly developed infrastructure, a difficult investment climate, and unequal resource utilization among regions.

In 2004 Indonesia became a net oil importer. As a result, Indonesia no longer benefits from high world oil prices, and the costs of subsidizing domestic fuel prices have put an even higher strain on the national budget. This has increased the need for foreign investment in the electricity sector, but the efforts have not yet given the intended results and Indonesia is still struggling to attract IPPs to the electricity sector. One important change instituted by the last electricity reform was the partial-liberalization of the sector through the opening of the end-user market to private participation. Other changes were increased authority to local governments in licensing and determination of tariffs. According to the new law, corporate bodies, cooperatives and self-supporting communities are for the first time allowed to participate in the supply of electrical power to end-users (figure 2.1).

The electricity sector organization is heavily influenced by the government's particularly strong authority. PLN also executes much power in the sector. The broader structure is somewhat fragmented and coordination among various authorities with more or less overlapping responsibilities, is a challenge for IPPs (Purra 2010). The figure below illustrates the broad organization map.

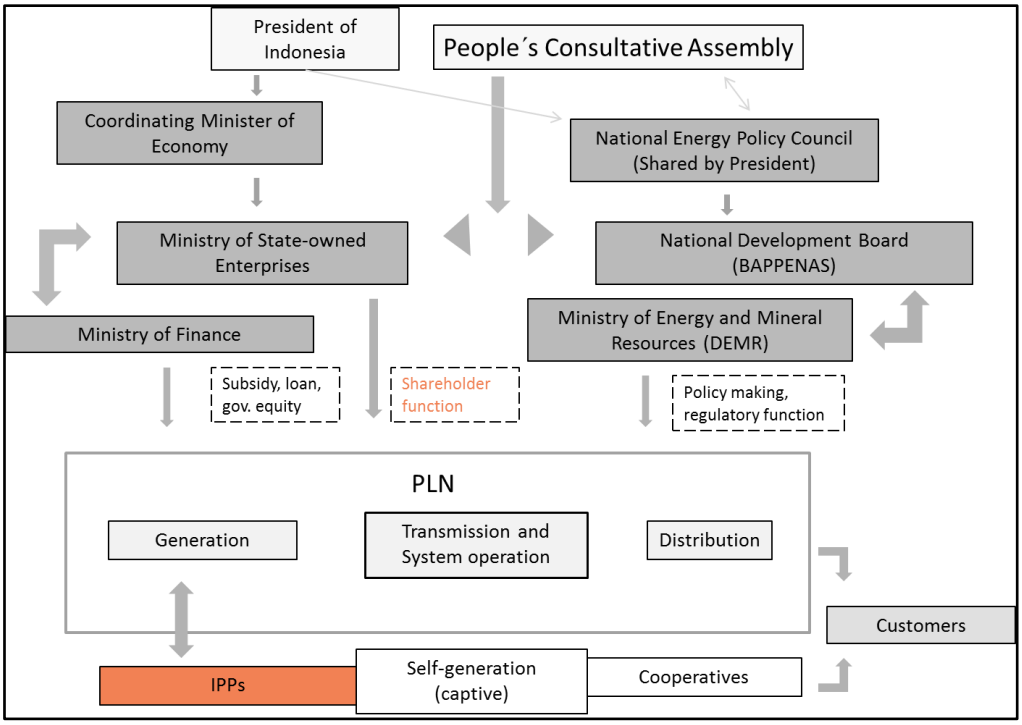

Figure 4.1: The institutional governance structure of the Indonesian electricity sector

After (Purra 2010).

Figure 4.1 shows the major institutions involved in the electricity sector. The arrows indicate line of authority and interaction. The figure shows the opening for IPPs within power generation.

A new IPP scheme is under planning and is expected to cover IPP guarantees to shift more of the political risk from the IPPs to the government to improve project finance-ability (Wiryawan and Deertz 2010). If and when those changes will come into force is uncertain.

4.2.2 Framework for future energy policy

The challenges posed by low electrification ratio, environmental threats and the unsustainable tariff structure in the existing electricity structure are widely acknowledged and incorporated in future aims for the electricity sector. The framework of future energy policy is centered on four main issues (Prasetijo 2010; USAID 2007):

1. *Diversification*: Reduce dependency on oil by expanding the use of coal, gas and renewable energy resources.

2. *Rational energy pricing*: Cannot uphold the subsidy and uniform pricing policy. Subsidies must be lowered or eliminated.
3. *Energy sector reform*: Decentralization of governmental decision-making and policies to attract investors.
4. *Rural electrification:* Most people without access to electricity live in rural areas. To increase the country electrification ratio, rural electrification is inevitable.

While having ambitious targets of increased electrification rates, Indonesia simultaneously aims to reduce its dependence on oil to 20%, increase the share of renewable energy sources to 15%, and cut emissions by 26% by 2025. To reach this target PLN aims increase the share of renewable energy (mainly geothermal and hydro) production, and substantially lower the diesel-fuel power generation (Latuhihin 2007; Prasetijo 2010). In practice, the progress in extending power supplies has been slow (Wiryawan and Deertz 2010).

4.2.3 Framework for renewable energy production

There is a huge technical potential to substitute existing diesel dependence by both off-grid and on-grid renewable energy supply (RES). The substitution of existing diesel generators to RES will have obvious environmental benefits. Extended electrification to households currently without access to electricity is equally important for economic progress. Despite its large potential, the development of renewables has been slow in Indonesia up to date. Many current regulations and policies slow down electrification through renewable technologies and are perceived as a major obstacle to attract investors and project developers (Sauermost 2008).

4.2.4 Small scale hydropower in Indonesia

The definition of what can be termed a small hydro project varies, but there is a generally accepted definition of generating capacity of up to 10 MW as the maximum limit of what can be termed small-scale hydro (Paish 2002). 10 MW is also the limit for what is termed *small-scale* in CDM. Indonesia also uses the 10 MW limit, and this will be the classification used in this paper. Indonesia also differentiates between *mini hydro* (1MW-10MW) and *micro hydro* (<1MW). The main emphasis in this thesis will be on mini hydro, because the smallest hydro

is not per date perceived economically profitable (NN (pers. mess))[6]. These are therefore not relevant from an investor's perspective.

Hydropower has a long tradition in Indonesia. More than 300 plants where built by the Dutch, during colonial times. Until the 1970s, several hundred small-scale hydro plants were built for captive use. Since then, many projects have stopped production, and more projects are going out of production, than new ones are established (Arter, Froend and Ritter 2005).

Currently, hydro is the only small-scale technology where production can be profitable for independent power producers (NN (pers. mess))[7].

4.2.5 Institutional framework for small-scale hydro producers

The country has since 2001 been, and still is, in a huge transition from a semi-communist, centralist state to a decentralized democracy. These massive institutional changes make the present institutional structure somewhat chaotic and reports document a worsened investment climate since decentralization. Particular uncertainty is related to licensing procedures, regulations and responsibilities in the electricity sector. The shift to a decentralized governance model has also had a documented effect of increased corruption (ADB 2005). There has been a trend towards delegating responsibility for political implementation to the lowest possible administrative authority. The *Bupati* – the head of local government - has therefore gained increased authority and responsibilities for various procedures facing small-scale hydro developers.

There are extensive policy and implementation requirements for renewable energy development. The institutional structure responsible for renewables is more fragmented than for conventional technologies in that they are not covered by a single Directorate and that actual responsibilities are not always reflected in the institutional and legal structure. The main governmental authority regulating the development of renewable energy in Indonesia is the Ministry of Energy and Mineral Resources (MEMR) and its agencies[8] (Tumiwa and

[6] Sari 2011, Respati 2011, Lacey 2011 (Appendix I)
[7] Febijanto 2011, Respati 2011, Pedersen 2011 and Sari 2011(Appendix I).

[8] The Directorate General of Electricity and Energy Utilization (DGE&EU) formulates policy and

Rumbitan 2009). Various ministerial regulations[9] have been issued in order to incentive a national direction for RE development in Indonesia

Despite many institutional difficulties, the attitudes towards renewable energy production are changing, and important changes in the institutional structure to ease the development of small-scale hydro have been implemented. For an overview of regulatory framework for promoting RE in Indonesia, see Appendix II. One major improvement is standardization of the Power Purchase Agreement (PPA) for small-scale hydro. Previously the selling price to PLN had to be individually negotiated and the process included a larger number of licenses to be obtained. With the standardized PPA, much of the licensing work for small-scale hydro is expected to be much less time consuming as the price negotiation process is abolished. PLN is also obliged to buy electricity produced by small-scale renewable energy sources (Fukuda and Siagion 2010).

4.2.6 The Clean Development Mechanism in Indonesia

The Clean Development Mechanism (CDM) is one of the flexible mechanisms under the Kyoto Protocol, intended to give industrialized countries a more low cost way to meet their GHG emissions reduction obligations. The CDM was expected to spur the interest in small-scale renewable energy projects in developing countries, but results have not been as good as expected. High transaction costs associated with the CDM-cycle has been identified as one main barrier. High TCs have been especially hampering for small-scale projects, where the relative amount of fixed TCs seems to outweigh the benefits realized. As a mean to reduce TCs, a simplified procedure was adopted in 2001. Despite this, recent research indicates that the CDM-related TC has continued to increase, rather than decrease for small-scale projects. See Bosi *et al*. (2010) for further details.

Most CDM projects in Indonesia are within biogas and biomass. In 2010 only two small-scale hydro projects where listed in the IGES registry of CDM projects (IGES 2010). Interviews with stakeholders in Indonesia revealed little confidence in the CDM mechanisms (NN

programs for RE development, The Directorate General of Minerals, Coal and Geothermal (DGMC&G) formulates policy and programs for geothermal development, Research Center of Electricity and Renewable Energy performs R&D in RE technology and The Training Center for Electricity and Renewable Energy performs training in RE for human resources and technology application (Tumiwa and Rumbitan 2009)

[9] The Law of Energy (No.30/2007) stipulates the issuance of presidential regulation to provide fiscal and other incentives forpromoting new and RE development, along with establishment of National Energy Council (DEN) as well as a set of rules for developing National Energy Plan (RUEN) (Fukuda and Siagian 2010).

(pers.mess))[10]. The broader uncertainty about the post-2012 future of CDM adds to the chilled interest.

Despite the relatively unenthusiastic attitudes towards CDM in relation to small-scale hydro in Indonesia, the CDM-related TCs are interesting in the more general debate about handling and reducing TCs for CDM and similar mechanisms. Also for the case investigated in this thesis, it has some direct relevance. The Norwegian/Indonesian small-scale hydro project *KF-gruppen/P.T. Sulawesi Mini Hydro Power,* which will be used as an illustrative case later in this paper, received final approval of CDM quotas from Bonn in May 2011. This is the first hydro power project in Indonesia to get approved CDM quotas (NN (pers. mess))[11].

CDM-related TCs will not be the main emphasis in this paper, but will be mentioned when relevant for the case investigated.

4.2.7 Indonesian business culture

Transactions include people and culture as well as formal institutions such as regulatory framework. TC can therefore also accrue due to cultural norms and differences and misunderstanding of these. A throughout description of Indonesian business culture lies beyond the scope of this paper. A brief review of the major differences compared to the business culture in what is normally referred to as the Western countries is however essential, due to the its' importance for transaction- and associated costs.

Katz (2008) describes the Indonesian culture as strongly group-oriented. Lasting and trusting personal relationships are crucial, also in business relations. Business transactions are more considered transactions between people than between companies. Good relations are therefore essential before closing any business deal. As Katz describes it: "*People in this country usually do business only with those they know and like. Establishing productive business cooperation requires a long-term perspective and commitment"* (ibid.:4).

The value of personal relationships and the time aspect of transactions will have direct relevance for international IPPs wanting to enter the small-scale hydropower sector in Indonesia. For more detail about the Indonesian business culture, see for example Perks and Sanderson (2000).

[10] Respati 2011, Febijanto 2011 (Appendix I).
[11] Fossum 2011 (Appendix I).

4.3 Transaction cost issues

As mentioned already, there is not much literature covering transaction costs borne by private actors, and naturally, even less exists in terms of transaction costs associated with small-scale hydro. Case studies measuring private transaction costs to date, have mainly investigated the field of agri-environmental payment schemes. See for example Falconer (2000), Falconer and Saunders (2002), Vatn *et al*. (2002), Rørstad *et al*. (2007), Mettepenningen *et al*. (2009), and Groth (2008). The few existing studies prove private TCs contribute to notable shares of total costs.

The relatively little interest in quantifying TCs can mostly be explained by the difficulty in finding good parameters for complex drivers, as well as lack of adequate data (Wang 2003). This is also a problem for the case investigated in this thesis. Because of this, the TC-drivers investigated will far from cover all TCs and TCs have not been possible to quantify. Quantified data is used where data could be obtained, but the numbers must be treated with a good portion of skepticism, and are mainly intended to indicate which TCs are the most extensive in the big picture. Despite this, I believe that the following analysis can provide some relevant insights on main drivers for high TCs for small-scale hydro investors and further give an indication of cost-reduction potentials.

4.3.1 Transaction cost issues for small-scale hydro

Khennas and Barnett (2000) provide the most relevant and extensive study on transaction costs associated with small-scale hydro. Their report is part of a larger World Bank program to determine best practice in rural energy development. Throughout their case-studies on small-scale hydro in developing countries, Khennas and Barnett give much attention to the costs that accrue in addition to production and capital costs. Their findings highlight the costs of *intermediation* as the greatest cost driver, and *capacity building* as the greatest of the intermediation costs. They make a point of the lack of documentation for those types of cost drivers: "Such activities (intermediation activities) are systematically omitted from the estimation of costs*"* (Khennas and Barnett 2000:33). Despite little quantified information, this cost driver is described as "extensive". For some of the cases investigated, they have done direct measurement of TCs. For one project investigated in Peru, it was documented that for every 100$ spent on production costs, an additional 15$ was spent on other costs (which according to the definition in this thesis are TC). The data is not directly applicable for this

thesis because the study is more than ten years old, and the cases investigated are mostly micro-hydro (<1MW), whereas the main emphasis in this thesis is mini hydro (1MW > 10MW).

Another potential TC driver identified by Khennas and Barnett (ibid.) is the involvement of particularly *high numbers of stakeholders* in small-scale hydro compared to other technologies.

Most studies focus on evaluating system- or governmental TC. But as Khennas and Barnett (ibid.) also have documented, private investors also incur huge TCs. They mention an exemplifying case is in Nepal where a private agent spent about two years developing a basic (1MW) micro hydro scheme, making 41 trips to the host country.

Another relevant study by Sovacool (2010) is based on interviews with 90 stakeholders in the renewable energy industry in Southeast Asia. Sovacool has investigated why the region has not expanded renewable energy production, despite expected benefits. The study reveals several barriers for renewable energy extension in the region, where the category of *non-technical barriers* is important. Amongst Sovacool´s findings is the *lack of knowledge* about the electricity sector and renewable energy sources as a major barrier. As one of his informants described it: "accurate and unbiased information about renewable energy options in Southeast Asia is usually unavailable, expensive, incomplete, difficult to obtain or nonexistent" (Sovacoll ibid.:1783). Another important non-technical barrier identified is the *skepticism about the renewable technologies*, which are often perceived to be more risky than conventional sources.

4.3.2 Transaction cost issues in Indonesia

A World Bank report from 2003 found that the majority of private firms investigated did not wish to return to Indonesia. Reasons for this reluctance include too high overall costs related to tariff adequacy, payment enforcement, legal foundations for contracts, regulatory frameworks, and political interference on the part of host governments (Williams and Ghanadan 2006:834).

A World Bank report (2009) on Indonesia goes further in identifying the various non-market and non-technical barriers to renewable energy extension, which are potential cost drivers.

The highlighted barriers are *weak rule of law*, *weak investment climate*, and multiple regulators which make the *institutional coordination complex*. Other obstacles are *weak legal and political accountability* and high level of *corruption* (The World Bank/Bank Dunia 2009). A more in-depth WB report on the Indonesian electricity sector from 2005 emphasizes *absence of standardized institutional arrangements* and *weak institutional capacity* at local level as other significant cost drivers (Dunia Bank /The World Bank 2005).

Potential causes for high TCs found in the existing literature described above can be summarized as:

- High number of stakeholders
- Weak rule of law
- Complex institutional coordination
- Weak political accountability
- Weak institutional capacity
- Lack of knowledge/skepticism about renewables (weak "enabling environment")

4.3.3 Transaction cost issues related to CDM

The issue of TC has been heavily debated in relation to the actual low cost reduction potential of CDM. The core argument of CDM is that it will offer a low cost approach to reduced GHG emission. The potential threat of CDM as a least-cost mechanism due to the reported high TC, has therefore received more attention than TCs in general and for other goods. Several initiatives have been established to measure the amount of TC accruing in the CDM process. Fichtner *et al*. (2003) have investigated private TCs investors in project based Kyoto mechanisms. They point to *weak procedures* and *difficult business environments* as core drivers for TC. More applicable information exists for CDM-related TC, than general TCs. Michaelowa and Jotzo (2005) have analyzed main findings from existing TC estimated. The main findings can be summarized as:

- High number of participants increase TC
- Learning effects can reduce TC
- Host country specifics is a crucial determinant for TC level
- Economies of scale is the most important determinant for the share of TC in total costs, because fixed TC contribute much to total TC
  (Michaelowa and Jotzo 2005).

- Weak procedures drive up TC
- Difficult business environments increase TC

Combining the major finding from the existing literature and finding from interviews can give a plausible estimate of which TC drivers are the main contributors to the assumed dead weight loss in the case investigated.

4.3.4 Main findings Indonesia

Through interviews in Indonesia, more country specific, perceived drivers for TC were revealed. Main drivers for high transaction costs for small-scale hydropower projects perceived by respondents interviewed in Indonesia can be summarized as:

- Capacity building (little local/regional capacity exists, unfamiliarity with technology).
- Corruption
- Slow bureaucracy
- Little transparent responsibilities
- Finding reliable local partners
- Contact with PLN

The findings will be described in more detail in the following analysis.

The table below is an overview of the main TC components that will be analyzed. The components are categorized according to the three TC *categories* and assumed *transaction cost drivers* based on the most likely TC drivers in previous literature and from interviews:

Table 4.1: Transaction cost components

TRANSACTION COST COMPONENTS	
TC CATEGORIES	**PERCEIVED COST DRIVERS**
INFORMATION GATHERING	Finding correct information and the "right" people to cooperate with
CONTRACTING	Obtaining all required licenses
LOCAL CONSTRAINTS	Business environment
	Corruption
CDM RELATED	CDM process

Because of the complexity and interlinks of institutions and related transaction costs, it is not always possible to place them within one strict category. Table 4.1 is intended to give a broad overview and framework for a systematic analysis, rather than defining clearly separable categories.

As introduced earlier in this thesis, the extent of transaction costs depend upon both the amount of costs spent on each TC driver, and time spent on handling the different TC drivers (Figure 2.2 and 2.3). Because the main focus of this thesis on pre-project implementation TC, a way reveal the extent of TC is too look split up the various phases experienced by a small-scale hydro developer up until production start and look at which TCs that are likely to accrue throughout the different phases.

The Hydropower Sustainability Assessment Forum (HSAF) is a collaboration between different agents trying to measure and guide performance in the hydropower sector. HSAF has developed a model based on project cycle and major decision points in hydro power development as a framework for assessments. By using this framework and add the TC categories applied in this thesis, the time-aspect of TC becomes clearer.

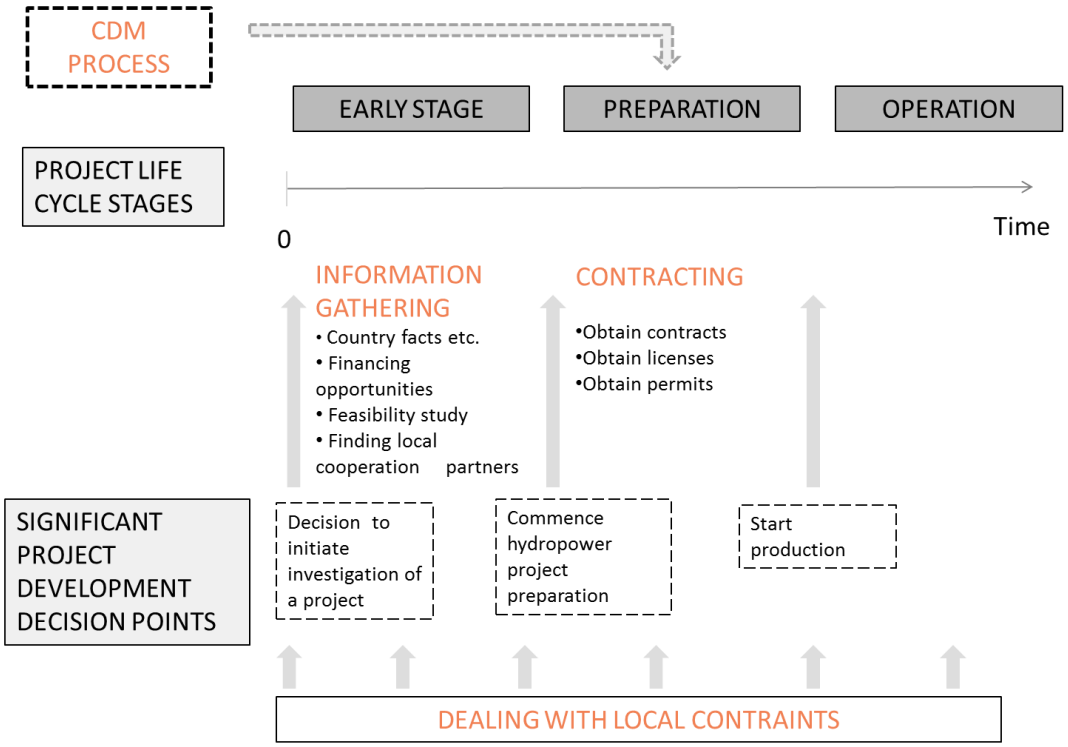

Figure 4.2: Hydro power life cycle phases and related transaction costs

Figure 4.2 illustrates the link between TC and time spent on the different life-cycle phases of hydro power development prior to production start. TCs related to information gathering accrue, mainly in the early stage; while TCs related to contracting mainly accrue in the preparation phase. The cost and time (which of course also is a cost) of dealing with local constraints are not so easily categorized within one particular time phase. Depending on which local constraint we are dealing with, they can accrue continuously or sporadically in all time phases. The TCs accruing in relation to the CDM process are placed outside the timeline, because this process can be conducted whenever after the project is planned. This process and related TCs do not necessarily influence the rest of the project cycle because the CDM application process is typically outsourced to a consultancy at a more or less fixed price.

In line with the argument presented in figure 2.2 and 2.3, the more time spent on each of the transactions, the longer it will take to the next phase, because the phases depend more or less on the finalization of the previous to realize the next. If the phases are expected to take long time or high uncertainty of the timeframes exists, private participants will require higher rates of return, and fewer projects might be initiated. The time spent on various stages of starting and running a business of any kind has for long been one of the most important constraints facing investors in Indonesia (The World Bank 2005).

Knowing more about which of the TC components are the most extensive, both make the financial planning and the targeting of operational management easier. The following section is an attempt to identify the components causing the most extensive transaction costs for small-scale hydro developers in Indonesia.

4.3.5 The costs of information gathering

Identifying right information and contacts

Lack of access to public data represents a major difficulty for doing business in Indonesia. Much official data is inaccurate, unreliable, and unavailable. Indonesia is ranked number 91 out of 138 countries in The Global Competitiveness Index 2010, where number one is the most transparent country (Schwab 2010). For private participators it can be difficult and time consuming to get an overview of both data relevant for production, such as load factor,

demand and water flow, as well as legal requirements relevant for operation within their project area (Heriawan 2010).

A widespread obstacle for private investors or project developers is the existence of individual requirements for different sectors and different regions and little public information about the different requirements. Information requirements are often complex and unclear and can vary largely between regions. A simple and clear listing of licenses required, and which steps need to be taken to obtain different permits, does not exist for small-scale hydropower development. One illustrative example is the newly accepted standardized Power purchase agreement (PPA) for hydro. Several of the respondents interviewed in Indonesia were not aware of, or uncertain about this new and highly relevant procedure, despite working closely with the field of small-scale renewable energy. This example of unawareness of highly relevant information appears to be more the normal state, than the exception. The US Commerce Secretary, Gary Locke, described the hesitation of US investors to invest in renewable energy in Indonesia by pointing out the lack of transparency: "*Businesses frequently don´t know how regulations are implemented or how the government comes up with the decision*" (Ekawati 2010).

Because private small-scale hydro development touches upon different aspects of the government's electricity targets, such as the promotion of IPP participation, promotion of renewables and increased rural electricity access, it also has to deal with several, often conflicting, incentive structures, legal requirements and authorities. With several overlapping support schemes and requirements, it becomes more difficult for developers to understand and assess the financial impact of their project (Dinica 2006). The respondents also highlighted the lack of a national blueprint as one major obstacle for effective information gathering and project realization (NN (pers. mess))[12]. These findings are coherent with existing literature on potential TC drivers where a high number of stakeholders' involved and complex institutional coordination contributes to the increase of TC.

Much of the uncertainty and time spent on finding correct information about regulations for renewable energy development is ironically a consequence of last years' attempts to ease the development of renewables. Because of the relatively recent focus on creating better regulatory incentives, the framework has been changing frequently over the last years

[12] Tumiwa 2011, Respati 2011, Pedersen 2011 (Appendix I).

(Siagian 2010). Siagian has found that several revocations of existing regulations, uncertainty over delegated authority in pricing for renewable power production, in addition to the broader decentralization process, has increased transaction costs related to information gathering.

Fukuda and Siagian (2010) emphasize another information related obstacle which more indirectly might be causing higher TCs. No system exists to grant public availability about best practices and lessons learned from various renewable energy support programs. This discourages learning effects and knowledge exchange about the most obvious TC drivers and how to best manage these.

Another important information barrier is the frequency of unclear property rights. This is particularly difficult in rural areas, where hydro development is most relevant. Identifying the owner of the land often proves difficult and is time consuming. The head of the village, the *Bupati,* has the authority to determine the land rights when uncertainty exists (NN (pers. mess))[13]. Additional costs due to delays are likely to occur if the site or river intended for small-scale hydro power production goes through more than one region, so that the property rights must be decided upon by more than one local authority. Solving property rights disputes are not so much dependent upon the size of the project as the amount of actors involved (NN (pers. mess))[14]. Many smaller projects on different sites will normally require the involvement of more actors and hence increase the likelihood of delays due to disputes and in that way increase the amount of TCs. Despite this, the relationship between numbers of actors involved and extent of TC is not a measurable correlation where the number of actors does not necessarily or straightforwardly determine the extent of TCs accruing. Several of the stakeholders interviewed highlighted the importance of having a good relationship with local authorities in smoothening the time spent on various transactions. This may also explain the varying time spent on transactions. On the other hand, such relations can prove more difficult to establish with numerous and fragmented actors, as is likely if the projects are geographically spread.

The unclear requirements and responsibilities have made it almost inevitable to make use of costly intermediaries when searching for correct information in Indonesia (The World Bank 2005). Most stakeholders interviewed in Indonesia also highlighted the need for local intermediaries when doing business in Indonesia and in particular when doing business in the

[13] Tumiwa 2011 (Appendix I).
[14] Fossum 2011 (Appendix I).

electricity sector because of its little transparent feature and rapidly changing regulations and authorities. Which intermediate is used is not irrelevant and was highlighted as one crucial point for project success. Finding an intermediary with good knowledge, who is trustworthy and has the influence to get things done, was highlighted as crucial for successful planning and pre-implementation. Finding the "good intermediary" is not necessarily correlated to the costs spent. Good local knowledge and well established contact networks can be equally determinant, as for any other hiring procedure. Intermediaries that have local knowledge and long-sustained relations to the country were by the respondents assumed to have a better chance at getting the "right contacts". On the other hand, the establishment of contacts was said to be a timely process requiring much time spent in Indonesia in the pre-planning period, often several years (NN (pers. Mess))[15]. Having people employed to do this for a long period of time is costly. One respondent (NN (pers. Mess)[16] directly mentioned this as the main reason for lack of international private participation in small-scale projects: "*The Norwegian companies successful in Indonesia have had several Norwegian and Indonesian people employed for a long time before starting investment or production*".

Despite some information requirements being less extensive for small-scale than larger projects, the main cost of both finding and paying intermediaries and being present in Indonesia appears close to fixed. Thus, such work will not be less time or cost consuming for smaller projects, which give a higher unit cost for smaller projects. These conclusions are further augmented by the fact that the institutional framework has been changing more for small-scale technologies than larger technologies, and that the legislative responsibilities for small-scale development are shared by several agencies.

It has proven difficult to determine the extent of the TCs related to the information gathering. The findings indicate that costs of information gathering are closed to fixed, but the lack of qualification cannot finally confirm this. How extensive this fraction on TC is, has been difficult to estimate because the category is not easily separable from the category of contracting. Another aspect is that most foreign IPPs do not start from scratch with zero information. Because the law requires minimum five per cent domestic ownership, common process is to join with an existing local hydro developer which has done much of the information gathering already. This was also the case for the development of P.T. Sulawesi Mini Hydro Power which will be described in more detail in chapter 5. For now, the best that

[15] Jacobsen 2011, Sari 2011, Fossum 2011 (Appendix I).
[16] Jacobsen 2011 (Appendix II).

can be said about the extent of TC related to information gathering is that access to correct information about the sector is generally described as time consuming, and that this aspect combined with a rapidly changing regulatory framework for small-scale technologies and renewable technologies seems to make up some part transaction costs experienced by IPPs.

4.3.6 The costs of contracting

The high investment costs and immobility characterizing hydropower development make it more dependent on reliable contracts and licenses than other small-scale technologies. The literature on power plant investment highlights the importance of ensuring long-term and reliable contracts before starting construction of the plants (Dinica 2006). Hydropower includes both energy and water aspects and hence is affected by a wide array of regulations (Ibenholt et al. 2011). The site dependency consequently makes the certainty about having all required licenses more important, to ensure that the investor will not at a later stage be held responsible for lack of permits. This inflexibility is the main reason for the emphasis on the various stages in the project cycle of hydropower development, as depicted in figure 4.2.The immobility also makes hydro developers more vulnerable to bribery and red tape. This aspect will be elaborated further in chapter 4.3.7.

Because production start is highly dependent on all contracts and licenses being secured, problems in retrieving these licenses can therefore substantially delay production start, and hence raise transaction costs and reduce profit. The difficult and time consuming process of securing all required licenses were also one on the most frequently mentioned drivers of TC for small-scale hydro development among the stakeholders interviewed in Indonesia and in the case investigated in chapter five.

As a starting point for quantifying the extent of TC accruing in relation to contracting small-scale hydropower project in Indonesia, the broader country context for contracting provided by Doing Business[17] proves useful. The numbers projected in the table below are not directly applicable[18] for foreign participators, the hydropower sector or for rural operation, but give an

[17] *Doing Business* is a database under The World Bank providing quantitative data to compare business regulation and enforcement across 183 countries (IFC 2011).
[18] The data is taken from the investigation of a company in a specific kind of business, typically a local liability company operating in the largest business city (IFC 2011).

indication of the cost and time of general contracting in Indonesia compared to other countries.

Table 4.4 Average contracting costs Indonesia 2011

Table 5.2: AVERAGE CONTRACTING COSTS INDONESIA 2011			
LICENSING CATEGORY	**LICENSING PARAMETERS**	**RESULTS of Indonesia Doing Business 2011**	**RANKING of Indonesia Doing Business 2011**
STARTING A BUSINESS	Procedures (numbers)	9	155
	Time (days)	47	
	Costs (% of income per capita).	22,3	
DEALING WITH CONSTRUCTION PERMITS	Procedures (numbers)	14	60
	Time (days)	16	
	Costs (% of income per capita).	173,3	
REGISTRING PROPERTY	Procedures (numbers)	6	98
	Time (days)	22	
	Costs (% of property value).	10,9	
ENFORCING CONTRACTS	Procedures (numbers)	40	154
	Time (days)	570	
	Costs (% of property value).	122,7	

Note: Ranking among 183 countries, where 1 is the country where doing business is easiest. Source: IFC 2011

Table 4.2 shows the number of licenses, time spent in obtaining these and the cost relative to Indonesian cost level. The obviously most time consuming transaction is to enforce contracts, which takes 570 days. Indonesia ranks very low, as number 154 out of 183 countries in this aspect. Also, the process of starting a business with all legal requirements is comparatively difficult in Indonesia. Despite this process being considerably less time consuming than the enforcement, it is considered even worse in the international comparison where Indonesia is ranked as number 155. At registering property the numbers and ranking are better, but still comparatively more difficult than almost half the countries surveyed. When the electricity sector is additionally described as the most difficult and time consuming sector for doing business in Indonesia, this branch of transaction costs related to all contracting processes appears to stand out as a particularly costly and time-consuming.

Obtaining licenses

Complicated and lengthy procedures for permit and licensing for renewable energy development is one of the most significant transaction cost drivers for investors and project developers. Fukuda and Siagian (2010) describes the permit and licensing process for renewable technologies as "major institutional bottleneck" in Indonesia (Ibid.:54).

The ongoing decentralization process highly affects the electricity sector and the context for pursuing contracts and licenses. Local authorities are responsible for approving investments in all areas except oil and gas. The key actors in permitting/licensing are the project developer, PLN central, the regional PLN office, and the Directorate General of Electricity and Energy Utilization (DGEEU) office (Fukuda and Siagian ibid.). What complicates and delays many transactions are the many unsettled disputes over division of authority between provincial and district government. This has resulted in numerous cases of duplicative laws and procedures. Further, the absence of common procedures and standards among the different local governments, makes the process of licensing more costly and time-consuming because the experiences from licensing in one region might not be applicable for licensing in another region. Akhtar (2003) found that a widespread issuance of conflicting license requirements have substantially raised transaction costs for private investors as a result of decentralization. Again this leads back to the previously mentioned difficulty of identifying correct information. Higher TCs due to a high number of stakeholders, complex institutional coordination and weak political accountability is perceived to be some of the major TC-drivers, both in the literature and by stakeholders in Indonesia.

The effects on TCs due to increased authority to local governments, is somewhat uncertain because of the relative novelty and partly unsettled structure of the decentralization process.

PPA and PLN

Several of the stakeholders interviewed (NN (pers. Mess))[19] identified the largest amount of TC for small-scale projects to stem from the process of negotiating PPA's with PLN, as these had to be conducted for each individual project and could take long time. One of the

[19] Sari 2011, Respati 2011, Jacobsen 2011 (Appendix I).

respondents mentioned an example of a 10 year negotiation of a PPA for one small-scale hydro project (NN (pers. Mess))[20].

The recent changes in the legislation affecting small-scale technologies[21] and hydro in particular[22] are expected to lower these transaction costs. Another change that might further lower transaction costs related to contracting is extended contracting validity of PPAs. Until recently, PPA's for small-scale had to be renegotiated every year (for captive generation), however now the contract time is set as long-term contracts, normally for 15 years.

Both the PLN license and the PPA have to be negotiated with PLN, at central or regional level. How difficult this negotiation is in terms of time spent has been difficult to determine. On the one hand, most stakeholders interviewed mentioned the contact with PLN as difficult and time consuming. The explanations for this were however more towards the institutional and economic structure outside PLN control[23], and a general slowness in bureaucracy, more than a particular difficulty of the PLN itself. On the other hand, most respondents also found that the contact with PLN has been improving recent years, but that the "smoothness" of this process depends much on the actors dealing with PLN, like IPPs negotiating for small-scale hydro. Three different respondents highlighted this fact when asked about the process of contracting with PLN: "*PLN are not as bad, if you know what you are doing*" (NN.(pers. Mess)[24] "*Not hopeless, for example, the PLN, Gov. etc. not that difficult to work with if you know how*" (NN.(pers. Mess)[25] "*The biggest challenge was negotiations with the PLN, this is easy now, as you have a fixed price. PLN is the easiest thing now, as long as you are serious*" (NN(pers. Mess)[26]

From the respondents in Indonesia, three acknowledgements seemed to prevail. First, the regulatory framework has been eased for all small-scale technologies by standardization and decreased number of required licenses. These changes are so recent that it has been difficult to

[20] Sari 2011 (Appendix I).
[21] Ministerial Regulation No.31/2009 of MEMR stipulates the purchasing tariff of RE-based power below 10MW by PLN, in which the tariff differs between each island by voltage of the interconnection (medium voltage or high voltage) (Fukuda and Siagian 2010).
[22] Standardized PPA for hydro…
[23] E.g: The selling price, which PLN does not control.
[24] Sari 2011 (Appendix I)
[25] Lacey 2011 (Appendix I)
[26] Respati 2011 (Appendix I)

evaluate the effect yet (NN (pers. mess)[27]. As these changes get fully incorporated and understood they can possibly lower transaction costs for small-scale projects compared to larger ones. This will however not necessarily be the case. Due to the second finding it appears from existing parameters and the respondents in Indonesia, as if the number of licenses does not in itself determine the time spent on licensing. These transactions, as transactions in other phases of the project cycle are not fixed and closely linked to the broader barriers of inefficient bureaucracy and corruption and the IPPs management of these transactions. Third, time spent depends much on how the IPP goes forward in these transactions. This indicates that the transaction costs related to licensing are generally high, but not fixed, and that right efforts taken by the IPP can reduce the time spent on these transactions.

Other permits

Being a decentralized country, the process of meeting all permit/license requirements involves many procedures at different government levels. Verification of compliance with rules requires compliance with not only the national and local governments, but also with local business associations (Moccero 2008). P.T., Sulawesi Mini Hydro Power (chp. 5) needed 42 permits in total for starting a 10 MW project in Sulawesi. Because most licenses are site specific the number of permits can vary substantially and is normally not comparable between projects from different regions.

It is in the interest the government to attract more IPPs in the electricity sector, and improvements regarding contracting are on their way. Government regulation 4/2010 indicates a maximum time limit for all licenses related to environmental implication analysis, clearance and compensation for transmission lines and land acquisition of 120 days (Wiryawan and Deertz 2010). One-stop shops (OSSs) have been set up to facilitate the consolidation of business licenses issued by separate bodies. The effects of these new regulations are expected to lower TCs, but the regulations are yet not fully implemented.

4.3.7 The costs of dealing with local constraints

This category of transaction costs is more difficult to grasp than the previous two categories. It includes several factors, more complicated to quantify. It is also the “new category”,

[27] Respati 2011 (Appendix I)

introduced in this thesis when building on Dahlman´s operationalization of TC. Despite difficulties in operationalization, this is a category that was frequently mentioned when asking about reasons for high transaction costs. As is evident from the discussion of the two previous transaction cost categories, the obstacles of dealing with local constraints and its related transaction costs affects the costs of other transactions such as information gathering and contracting. The more is known about these costs and their extent, the better it will be to assess the financial viability of projects and to target the most obvious and extensive transaction costs for reduction measures, and thereby create or increase profitability of a project.

Business environment

Starting a business in Indonesia is described as a complex, uncertain, costly and time consuming process (The World Bank 2010). "*There is considerable consensus among policymakers and the business community that a weak business environment is among the most important obstacles to investment in Indonesia* "(Moccero 2008:6).

Table 4.3 illustrates the difficulty of doing business in Indonesia compared to other countries, based on DB data:

Table 4.5: Indonesia´s ranking in Doing Business 2011

PARAMETER	RANK (Doing Business 2011)
EASE OF DOING BUSINESS	121)
STARTING A BUSINESS	155
PROTECTING INVESTORS	44

Note: Ranking of 183 countries. Selected parameters from Doing Business, Indonesia (IFC 2011:2). Data in *Doing Business 2011* are current as of June 1, 2010.

The low ranking on "starting a business" in table 5.3 proves the severity of country specific constraints facing private participants wishing to start a business in Indonesia. The ranking in "ease of doing business" as number 121 out of 138 countries indicates that the broader climate for doing business is challenging. Dealing with these challenges are likely to incur continuous costs on the private actor.

The Global Competitiveness Report, published every year by the World Economic Forum (WEF) goes deeper in indentifying what specific factors contribute to the biggest obstacles for

private investors. The figure below depicts the factors perceived most hampering for doing business in Indonesia in 2010:

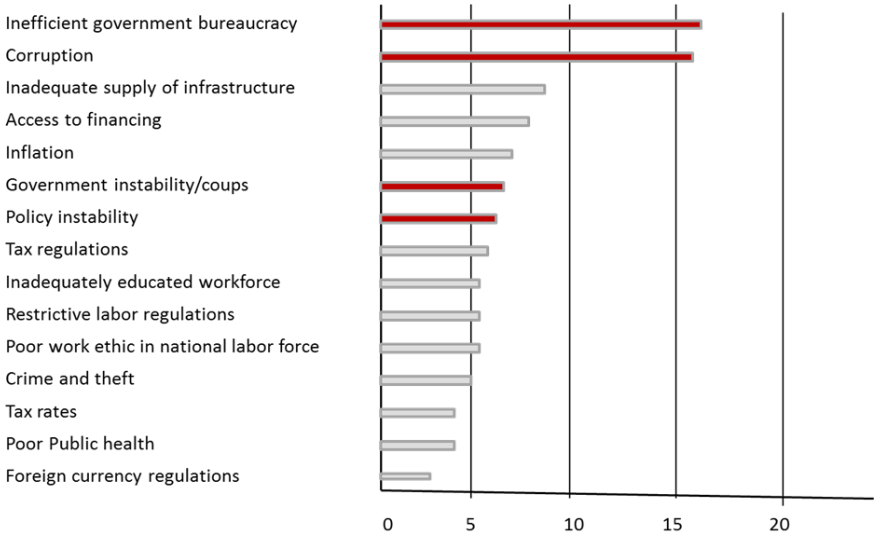

Figure 4.3: Most problematic factors for doing business

Note: From a list of 15 factors, respondents were asked to select the four most problematic for doing business in their country and to rank them between 1 (most problematic) and 5. The bars in the figure show the responses weighted according to their rankings. The factors most relevant for transaction costs as defined in this thesis are highlighted in red. Source: The Global Competitiveness Report 2010-2011(Schwab 2010).

Figure 4.3. shows that two factors stand out as the most problematic when doing business: "Inefficient government bureaucracy" and "corruption". These findings were confirmed by the stakeholders interviewed in Indonesia. As one respondent described it: "*The investment environment in general in Indonesia is crummy (..). Project developers have to work in an extremely uncertain framework* (e.g.the Indonesian bureaucracy)" (NN (pers. mess))[28].
In line with my argument about revealing the most obvious transaction cost drivers, the emphasis of this part will therefore be mainly focused on these two transaction cost drivers.

The cost of dealing with inefficient bureaucracy

Delays caused by inefficient bureaucracy can occur in almost all stages of a hydropower production cycle and contribute to significant transaction costs. The most costly delays are of course when production cannot be started because some bureaucratic halt keeps the project developer from obtaining mandatory permits/licenses. One major challenge is to identify the correct authority in the myriad of bureaucratic areas, sections, levels etc. Several respondents highlighted the misbalance between the huge size of the bureaucracy on the one hand and

[28] Brown 2011 (Appendix I).

relatively few offices, and even people on the other hand, that have actual influence and capacity to process a case (NN (pers. mess))[29]. Relatively few people work directly with renewable energy issues, and even fewer with small-scale hydro. Despite this, there are many actors indirectly involved, and some respondents highlighted again the problem of fragmented authorities and lack of institutional coordination. The problem appears to be that several ministries have different and little coordinated involvement in the small-scale hydro area. Several respondents blamed the broader inefficiency of the Indonesian bureaucracy more than particular parts of processes as the major cause for delays and driver for high TCs. Because small-scale hydro development both depends upon extensive contact with the local bureaucracy due to location, as well as extensive site specific environmental regulations because of the technology, this effect was assumed to be extensive for small-scale hydro developers (NN (pers. mess))[30].

Regional authority and bureaucracy

Because small scale hydro is mainly located outside the big cities, most bureaucratic contact for IPPs is towards regional governmental level. The shift of authority to regional authorities, and partly undefined responsibilities, has had well documented and negative impacts on the business environment (Moccero 2008; Kuncoro 2006).

Two aspects stand out from the interviews and relevant studies: First was the weak local capacity in treating energy related aspects. The other aspect frequently mentioned was the increased dimension of corruption and bribery when dealing with regional authorities.

Lack of local capacity

The problem of weak local capacity for the development of renewable energy services is not unique for Indonesia. It is a widespread problem in developing countries, that renewable energy capacity is non-existent or immature at best. Mantiner (2006) describes the failure of many well-intended renewable energy projects to be caused by lack of broad support, and absence of knowledge to maintain projects in local communities.

[29] Jacobsen 2011, Sari 2011, Respati 2011(Appendix I).
[30] Lacey 2011, Respati 2011 (Appendix I).

When asked to describe the biggest obstacle for small scale-hydro development most respondents mentioned lack of local capacity (NN (pers. Mess))[31]. The lack of capacity include both lack of skilled labor, little knowledge about renewables among local authorities, lack of support for renewable energy and lack of local financial means to implement national policies. From previous literature it was evident that an "enabling environment" for small-scale hydro is one key determinant for the success of small-scale hydro projects (Khennas and Barnett 2000). As is evident from previous findings in this thesis, good relations with local decision makers is a major factor determining the time spent on various transactions between IPPs and authorities. Problems with lack of technical knowledge in combination with skepticism towards foreigners can make these transactions more troublesome, and hence more costly (NN (pers. mess))[32]. Again, the issue of decentralization was mentioned as the origin of the problem by several respondents. Regional and local governments have been given authority over electricity development without simultaneously being trained to conduct this. The capacity level and attitudes towards renewable technologies and small-scale hydro in particular varies strongly across regions.

Corruption

It is futile to discuss foreign investment in Indonesia without touching upon the extensive problem of corruption. Indonesia is ranked as number 110 out of the 178 countries in the Transparency International Index (2010) and ranked as number 95 out of 138 countries in The Glocal Competitiveness report (2010), where number one in both rankings are the least corrupt countries. According to the Transparency International Index, the corruption level is increasing. Norconsult (2010) describes construction and energy sectors to be the most corrupt sectors on an aggregated level.

Corruption can be defined in various ways. When discussing corruption in this thesis Dzhumashev`s definition will be used: "*Corruption is defined as a use of public position to create and capture private rents*" (Ibid.:2010:2). The academic discussion[33] over the economic effects of corruption is complex and falls beyond the scope of this paper. Most, empirical studies however, find that corruption is bad for economic growth and investor

[31]Tumiwa 2011; Lacey 2011, Sari 2011, Pedersen 2011(Appendix I).
[32] Lacey 2011 (Appendix I).
[33] Two major branches argue against each other in the literature on the economic impact of corruption. The first branch argues that corruption has a negative effect on economic growth in that it makes up a big burden to the private sector. The other branch argues opposite that corruption can increase efficiency. Corruption is here understood as an opimal response to the market distortion of regulative burden (Dzhumashev 2010).

returns (Dzhumashev 2010; Mauro 1995, Rahman *et al*. 2004). I will therefore assume that corruption raises costs for IPPs in Indonesia.

Kuncoro (2006) has done an extensive survey on corruption facing private firms in Indonesia after decentralization. This major institutional change has made corruption more unpredictable since more fragmented authorities and responsibilities have opened up for more levels and individuals to demand bribes. The corruption often takes form of additional permits or levies imposed and/or intentional bureaucracy delays. Kuncoro identified "customized delays" to be a significant source of corruption. Bribes paid are based on the extent of "red tape"[34] at the local level, where the extent of red tape is set locally. Too many new local levies, and the uncertainty arising from the presence of many agencies demanding bribes were the most important corruption related issues of the firms investigated (Kuncoro ibid.).

It is difficult to distinguish the transaction costs arising from corruption from those of contracting and dealing with the Indonesian bureaucracy as previously discussed in this thesis. Previous studies from Indonesia have found that the excessive and fragmented regulations raise private-born transaction costs and lead to corruption, because firms are forced to succumb to illegal payments to speed up the processes of obtaining licenses and public service connections (ADB 2005). Henderson and Kuncoro (2004) argue that bribes and management time spent in dealing with government officials in Indonesia is a complementary relationship, in that firms that pay to fasten transactions still have to spend much time with local officials to maintain good relationships. They have further quantified the share of additional payments in an empirical study on Indonesia. It was found that firms report to pay 10% of total costs in additional costs and spend more than 10% of their management time with government officials in Indonesia. This is in line with Kuncoros findings from (2006), documenting that firms on average spend 8% of costs on bribes and more than 10% of the total time spent in "Smoothening business operations". Other relevant findings from Kuncoro's study (2006) revealed large regional variations in terms of corruption-related transactions.

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[34] Red tape is a: "*Colloquial term for bureaucratic practice of hair splitting or foot dragging, blamed by its practitioners on the system that forces them to follow prescribed procedures to the letter. It gets its name from the color of the ribbon used in tying government documents*" (Business Dictionary 2011).

Rivayani (2011) has in a recent study documented that corruption in Indonesia still has not improved after decentralization, and remains "a chronic and persistent case" (Ibid.:1). Rivayani has found that after decentralization took place, local government imposed a huge amount of new local regulations concerning taxes, levies and other fees. In addition, regional governments also created various policies to regulate business activity. He further found that this caused firms to spend more time dealing with government officials.

Both Rivayani (2011) and Kuncoro (2006) have documented relationships between the extent of the corruption barrier and the size of the firm. They found that bigger firms are less vulnerable to pressure of corruption because they have higher bargaining power due to their bigger influence on the local economy. For larger firms it also proves easier to establish contact with higher level government officials and hence the pressure towards illegal payments lower in the system can be avoided. Kuncoro has further documented that the "small-medium sized" firms are the most vulnerable to corruption pressure and that both smaller and bigger firms experience less problems. He explains this with that small firms are not being "worth it" small firms being and big firms having enough influence and bargaining power to avoid it more easily.

Because of the criminal aspect of corruption, it is off course difficult to reveal the extent of transaction costs that arise in relation to corruption. The widespread corruption culture will contribute to extensive TC in dealing with the bureaucracy, either in form of actual payments and costs of time spent with governmental officials, or just as time spent with governmental official. It seems likely that a firm not adhering to illegal payments will have to spend even more time with government officials to speed up processing. The expected time spent on maintaining good relations with officials therefor appears to be more or equal to 10% of total time spent in management.

4.3.8 CDM-related transaction costs

Debates concerning (too) high transaction costs accruing for small scale projects have been frequent last years. The well documented relative high share of TC for small-scale projects related to the CDM cycle[35] threatens the core argument of CDM as a low-cost way to meet

[35] The CDM cycle consists of seven steps: 1) Preparation of Project Idea Note (PIN), 2) Preparation of Project Design Document (PDD) 3) Issuance of Letter of Approval (LoA), 4)Validation of PDD by DOE, 5) Registration of PDD, 6) Verification and Certification, 7)Issuance of CERs, for further details see (Hallre 2011).

GHG emission reduction target. According to Bosi et al. (2010), important reasons for the relative high share of TCs for small-scale CDM projects is that the price for validation of a project is not based on the size, but the complexity of a project, and that many small-scale projects are within areas where validation is more complex. Worldwide, hydro contributes to a substantial share of total CDM projects. Hydro is an established technology, and the CDM approval process for hydro is considered relatively simple compared to other technologies (Cosbey *et al.* 2006).Despite being relatively straightforward, the small-scale hydropower projects will face more or less the same CDM-related TCs as for larger hydro. The common approach to the CDM application by IPPs in Indonesia (NN (pers. mess))[36] is outsourcing it to a private consultancy specialized in this process. This cost is, as indicated by Bosi *et al*. (2010) close to fixed and will place a larger economic burden on small-scale projects than larger ones.

Compared to other TC components, the cost of getting CDM is easily found. The major issue will therefore be the uncertainty considering wither a particular project will in fact be granted CER credits or not. This uncertainty will off course go for both small-and large projects, but due to the relative higher share spent on the application and the relative larger share potential CERs will benefit small-scale projects; this will be a more crucial TC component for small-scale projects.

The broad sentiment towards CDM in Indonesia appeared unenthusiastic from the respondents in Indonesia. One respondent highlighted the short time frame of Indonesian planning and risk-aversion. The long time planning and long time period between spending and potential returns were highlighted (NN (pers. Mess))[37] Others explained the low interest by lack of benchmarks and that PLN does not have a formal procedure for considering or applying for CDM (NN (pers. Mess))[38]

4.3.9 Summary of findings

Transaction costs should be treated more directly because they are expected to make up an extensive part of total project costs in a developing country like Indonesia. This thesis also argues that some TCs will always accrue, but where extensive TC are experienced, reduction

[36] Fossum 2011 (Appendix I).
[37] Brown 2011 (Appendix I)
[38] Respati 2011 (Appendix I)

of these seems possible. This requires knowledge of what causes these costs. The transaction cost analysis above provides an analysis of what appears to be the most evident TC components for foreign IPPs entering the area of small-scale hydro power production. The most important findings can be summarized as:

- Deficient and little accessible public data make early planning time consuming and/or dependent on local intermediaries to understand legal requirements.
- Local contacts are crucial. Finding the "right" local contact(s) stands out as the most influential factor which will determine the ability to keep the TC level as low as possible for all other TC components discussed. Finding the right contact is time consuming.
- Obtaining all licenses required for hydro power production is contributing to an extensive share of total TCs and is the most frequently mentioned TC driver. The official procedures are easier for small-scale projects than for larger hydro. Despite this, this process is not necessarily less costly for small-scale projects because it seems to be more the general slowness of the bureaucracy that affects the time spent, than the official requirements themselves. The inefficient bureaucracy is closely linked to the cost-issues of corruption and time spent at keeping good relations with government officials.
- Doing business is comparatively difficult in Indonesia, and electricity sector is considered a particularly difficult sector which indicate substantial TCs,
- The effects of decentralization increase uncertainty and influence most other TC components

5 An illustrating example: The experience of an IPP

Much of the findings in the cost analysis indicate that IPP participation in small-scale hydro production in Indonesia is risky business in terms of much uncertainty related to financial aspects and expected profit. This has led many investors to "turn in the door" and decide not to enter this fraction of the Indonesian market. This does not mean that it is impossible to make profit on small-scale hydro power production. The Norwegian/Indonesian hydropower company PT. Sulawesi Mini Hydro Power is currently producing and realizing profits from their project Manipi Hepp. Their experiences related to the transaction cost issues discussed in the previous section will help to shed more light on the existence and extent on transaction costs arising, and how to keep them low enough to ensure profitability.

The data used in the following case study is mainly retrieved from company reports and interviews with Project Manger Knut Fossum (KF- Gruppen) and Managing Director Tor Syverud (Tinfos).

5.2 Project background

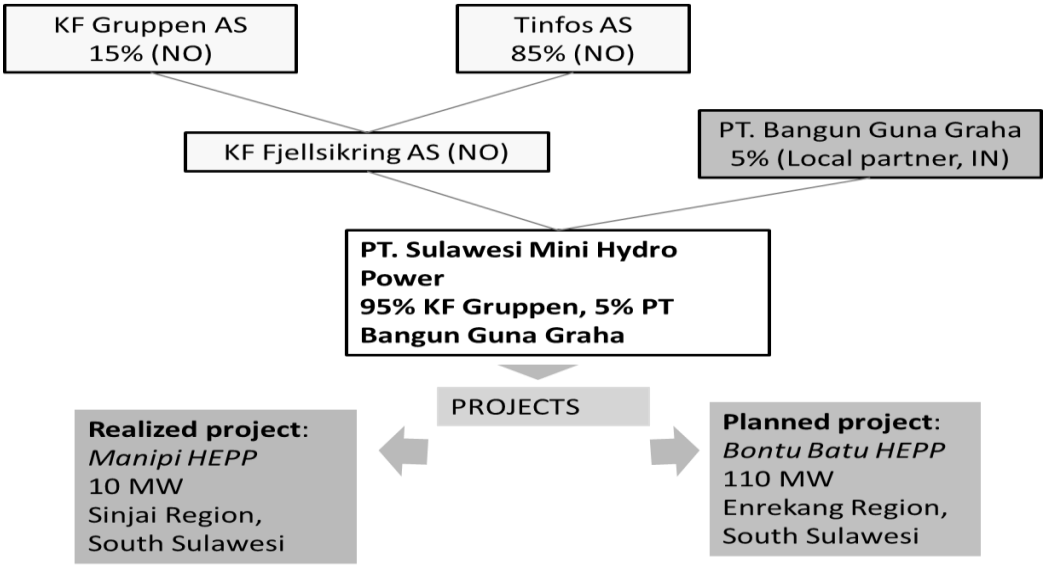

Figure 5.1: Organization of ownership and companies

Business concept and current status

The business concept of PT. Sulawesi Mini Hydro Power is to develop, build and own hydro power plants in emerging markets based on Norwegian expertise and technology. The first realized project, Manipi HEPP is a small-scale hydropower project located in South Sulawesi

Region. Four more projects in Southern Sulawesi are under planning. Buntu Batu, large scale (110 MW) is scheduled for commercial operation date July 2015.

The business concept is not small-scale hydro, and the realized small-scale project Manipi HEPP is mainly intended as a "pilot" to obtain knowledge which is transferable to the realization of larger projects. Coherent with previous findings and interviews in Indonesia, this is a natural strategy since higher profits are expected from larger hydro projects than smaller ones. Despite this, the experiences can give valuable additional information on transaction costs accruing for IPPs in small scale-hydro. The realized small-scale project that will be analyzed is in itself profitable. This proves that small scale (mini-hydro) development can be profitable in Indonesia, though larger projects generate larger profits.

Manipi HEPP, 10 MW Hydro power project, Sinjai region, South Sulawesi, Indonesia

Table 5.1: Manipi HEPP facts

- Generating capacity: 10 MW (45 GWh) produced by two turbines (3,5 MW and 6, 5 MW)
- Run-of-river
- All electricity produced is sold to PLN and distributed through the grid.
- Financing: Norwegian bank
- Construction cost: 22 Million USD.
- Cost overrun: 20%
- 28 000 tons CDM quotas

Involved parties

- Shareholders in PT. Sulawesi Mini Hydro Power
- Shareholders KF Fjellsiking AS (Norway)
- PLN as authority, buyer and distributor
- Bupati in Sinjai Region
- Bupati in neighbouring region, Gowa
- Governor and responsible for water rights in Province of South Sulawesi
- Autoritets in Kampung village

Financial situation

Manipi HEPP has been generating profit from the first day of commercial operation date (COD) and is considered a successful investment. The path towards profitability has however not been without obstacles. COD was delayed by 1.5 years and the project experienced a cost overrun of 20 percent, mainly because of the delayed COD. The delay and cost overrun were identified to be caused by three major factors. First, Sulawesi had unusually heavy rain during the construction period. The rains caused severe flooding and mudslide which led to an additional unexpected cost of repair of about USD 400 000 – 500 000 (1, 8- 2, 3 percentage of total costs). The second unexpected incident was the financial crisis which hit before financial closure was secured. The crisis weakened the financial situation of KF Fjellsikring and made financial closure more difficult than expected. The third reason, which is the most important when, investigating transaction costs, was the many other reasons for delays and related costs accruing for the project.

Timeline of project

Figure 5.2 shows the particular timeline of project cycles and transaction cost drivers for Manipi HEPP based on the general figure presented earlier in this thesis (Figure 5.2).

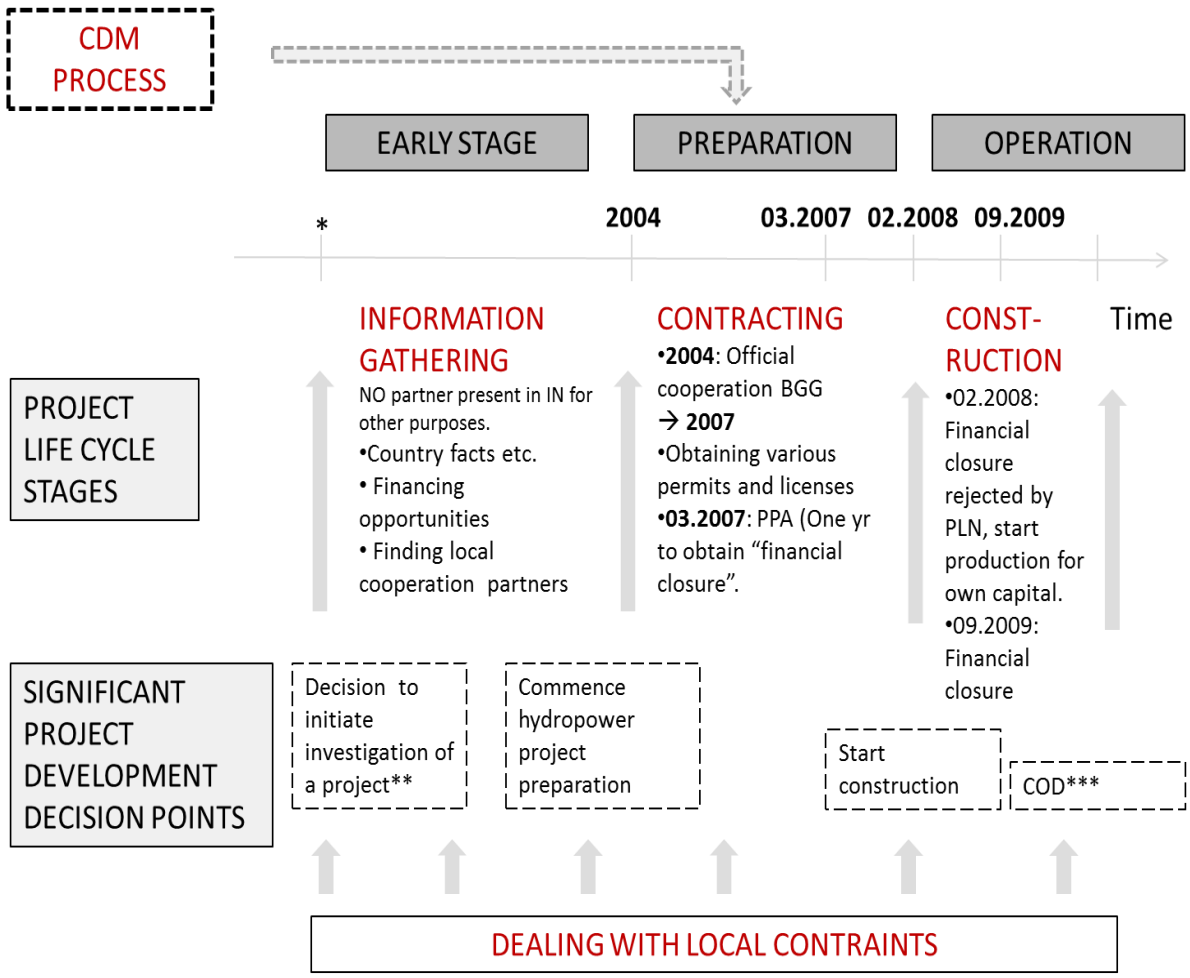

Figure 5.2: Manipi HEPP life cycle phases and related transaction costs

Note: BGG: PT Bangun Guna Graha (Indoneisian company (see figure 5.1)) *: The time for NO partner presence is uncertain, but was present several years for other purposes before 2004. **: The presence in Indonesia was for other purposes and the decision to investigate is overlapping with investigation for other purposes. ***: Commercial Operation Date.

Figure 5.2 depicts the actual experienced time line of Manipi HEPP based on the life cycle phases for hydro projects more generally (figure 4.2). The actual time spent before COD turned out to be significantly longer than the planned time schedule. The various reasons for the experience delays are closely linked to the transaction cost components analyzed in the previous section. This will be elaborated further in the following section. Transaction cost

issues for Manipi HEPP will be discussed by following the same classification and order as the general transaction cost analysis in the previous section.

5.3 Transaction cost issues Manipi HEPP

5.3.1 Costs of information gathering

The transaction cost category of "costs of information gathering" is closely linked to the specific time period "early stage" (figure 5.2). For Manipi HEPP, this time period is somewhat difficult to specify because most of the information gathering and establishment of local contacts was conducted by the Norwegian person that was to become project manager of Manipi HEPP, before planning the project. The project was therefore more a result of an already established local knowledge and contact network than the other way around. When the official decision to start project preparation was taken by signing the official agreement with the local partner, this was a result of a long-sustained personal relationship. The time spent on this phase and the related costs can therefore not be seen as TCs accruing for the particular project.

The long-sustained and close relationship to the local partner, BGG, before formally entering cooperation, is highlighted as one crucial success factor for the project by project manager. He highlights the value of choosing a real local partner instead of "straw men" to meet the legal obligation of minimum five percent Indonesian ownership. When formally establishing the joint Norwegian/Indonesian Company; PT Sulawesi Mini Hydro Power, BGG had conducted much of the information gathering, as well as some of the licensing, already. This resulted in less time spent on information gathering, than projected by the Norwegian partner beforehand. This meant that the project could proceed to the next phase of "preparation" (Figure 5.2) sooner.

For the particular project of Manipi HEPP, transaction costs related to information gathering did not make up a large share of total costs.

5.3.2 Costs of contracting

Despite much of the work on information gathering and some of the licensing were conducted before the establishment of PT. Sulawesi Mini Hydro Power (SMPH from now) in 2004, much time remained for obtaining all required permits. For Manipi HEPP, totally 42 permits were required. Table 5.3 lists the most important ones:

Table 5.3: Transaction cost items

List of important permit requirements

- Direct Appointment for IPP (*Ministry. of Energi and Mineral Resources*)
- Concession for the rivers (*Region of Enrekang*)
- IMA, Environmental Permit (*Ministry. of Environment*)
- IUKU[1] (*Ministry of Energy and Mineral Resources*)
- PPA (*PT. PLN (Persero*))

Other local permits, such as:

- Construction Permits
- Building Permits.
- Permit for the dam Construction
- Water License Permits
- Financing Approvals for foreign loans, (*PKLN[1] approval*)
- Import Licenses

Source: Fossum 2010

Most time consuming permit processes

The overall process of obtaining all permits took longer time than expected beforehand and contributed to a large extent to delayed commercial operation date and project cost overrun. The most time consuming permit processes where:

Financial closure

The first financial closure presented to PLN in February 2008 was rejected because the first loan payment had to be paid up-front. The project developer was not aware of such practices.

The lack of accessible blue-prints for which requirements must be fulfilled for each permit, directly contributed to the delays and increased TCs for Manipi. PT. Sulawesi Mini Hydro Power had to start construction financed by private capital, which contributed extensively to the cost overrun.

Another, maybe more unexpected problem that affected the financial closure was the problem to obtain due-diligence, loan verification from the Norwegian bank. Fossum[39] (2011) claims the most problematic factor to be skepticism about investments in Indonesia in general, and little interest for small-scale projects.

[39] Appendix I

PKLN Approval

PKLN approval is the Indonesian states approval of foreign loans. This is required for foreign loans to finance activity in the electricity industry. The license has to be approved by six different ministers, a process which proved be extremely time-consuming and did contribute to delays for Manipi HEPP.

Again, good and established contacts were highlighted as the key to speed up this process. SMHP benefitted from a bilateral energy agreement between Norway and Indonesia, which gave easier access to high level officials. Also the presence of the Norwegian Embassy helped lifting the process to higher official level and helped getting the final approval sooner than would otherwise have been possible.

River concession

Obtaining the river concession also proved more time consuming than projected. The river in Manipi runs through two regions, and the two Bupatis (heads of regions) issued the same license for two different project developers which caused dispute and delays. Another transaction cost related problem also occurred as this dispute placed heavy pressure for illegal payments on the IPP. The cost issue of corruption for this particular project will touched upon later.

PPA

From the information given by respondents in Indonesia, the issue of getting the PPA and general cooperation with PLN as a potential TC driver was not straightforward. PLN has traditionally been blamed for much of the "hazzle" experienced by IPPs in the energy sector, but the respondents highlighted that PLN procedural has been improving and that successful cooperation is much dependent on the proceedings of the IPP in this process.

The experience of SMHP was that both obtaining the PPA and the general contact with PLN has not been an extensive contributor to TCs. PLN has for example never been a day late on payments. The general attitude is that PLN is positive towards IPPs due to the lack of own capacity to meet electricity demand.

For SMPH the transaction costs related to "contracting" proved to be more extensive than projected, and contributed considerably to the cost-overrun. The long time spent due to the difficulties experienced in this process was extensively, but not exclusively contributing to delayed commercial operation date. More specifically lack of information caused delays in

getting financial closure and using a border river caused unexpected delays. Indirectly, the first transaction cost category of information gathering therefore affected the problems and costs arising in licensing as lack of information made this process more costly.

5.3.3 Costs of dealing with local constraints

Business environment

SMHP uses a risk level barometer for determining the business environment in Indonesia. The various components are evaluated as risk level: -"low", - "medium" or -"high". (NN (pers. mess))[40]. The four components considered to contribute to "high risk" are:

- Quality of legal system
- Corruption/red tape
- Regulations
- Infrastructure quality

The first three of the most risky components fall under the category of transaction cost components as operationalized in this thesis. The risk assessment of this particular IPP is coherent with the more general findings, identifying corruption/red tape, unclear regulations and authorities as major transaction cost drivers. The comparatively risky business environment in Indonesia can also seem to have a direct effect on IPP investments as financing from country of origin, as mentioned for the problems experienced with the financial closure.

Inefficient bureaucracy

The widespread problem of inefficient bureaucracy and slow procedural in Indonesia, and in the electricity sector in particular has undoubtedly affected the development of Manipi HEPP. Fossum[41] (2011) highlighted the problem of slowness in both development and adaptation of policies and regulations to institutionalize decentralization. He emphasized the problem of institutional coordination and undefined authorities, which again give room for more pressure towards illegal payments. The uncertainty related to authorities further complicates the process of establishing good contacts, as one has to choose which governmental level to focus on.

[40] Fossum 2011 (Appendix I)
[41] Appendix I

Despite this, the Norwegian owner of SMHP, were aware of these challenges before deciding to invest. Both directing manager of the biggest shareholder[42] and project manager[43] emphasized that what matters for profitability is the end result. Despite transactions costs being higher in Indonesia than potential other host countries, the taxes are low and the capacity big, so that the NPV of the project portfolio can be positive and better than alternatives despite some cost function being higher than alternatives. This aspect is at the core of the argument of treating TCs more directly and alongside other costs and will be elaborated further in the discussion section.

Corruption

The high level of corruption is a major challenge for IPPs in Indonesia, also so in the realization of Manipi HEPP. The experience with Manipi HEPP confirms findings in existing literature and interviews with respondents in Indonesia. The corruption is described as red tape where case processing is intentionally delayed or halted. Despite the institutionalized system of corruption and worsened corruption situation after decentralization, the project manager claims that it *is* possible to realize projects without illegal payments. He lists both general and more specific ways to get passed corruption pressure. In general, the returning issue of having good and established relationships with local and regional governmental officials is one key. Again, the higher up in the bureaucracy the decision is taken, the easier it is to avoid corruption and for Manipi the project developers has worked in the shed of the official Norway through the relationship with the Embassy as much as possible. KF-Fjellsikring has followed a strategy of establishing good relationships at all levels to ease all transactions. As Fossum (2011) describes their strategy: " (..) *to get to know local and regional governmental we worked at ground level and upwards. Participation in Indonesia requires good local knowledge and enough time and effort to get to know people, both in the production and in governments*" (NN (pers. Mess))[44].

During the projecting of Manipi HEPP, SMHP has fired two of their own, Indonesian employees due to corruption or theft. The situation where pressure for illegal payments was most intense was when trying to settle the dispute over river concessions. The project could not process without the river concession and SMPH was in a pressed situation. The dispute over the concession got solved by initiating negotiations between PLN, the two Bupatis

[42] Syverud 2011 (Appendix I).
[43] Fossum 2011 (Appendix I)
[44] Fossum 2011 (Appendix I)

(heads of regions) and the two firms that had both been awarded concession. SMHP could prove their right as they had written minutes from previous meetings. Story ended with PLN accepting the first concession given to Manipi. Despite being solved, this incident was another contributor to the delayed COD.

To avoid corruption, SMPH obtains photos and signature from all transactions where money is being transferred. This method makes the barriers for claiming additional payments higher and improves the transparency.

Another important management step taken by SMHP to reduce risk and TCs associated with corruption and lack of trust in the legal system, is to institutionalize arbitration of Indonesian law under the court of Singapore.

Corruption, like inefficient bureaucracy and difficult business environment did for this particular IPP, increase time spent on various transactions and influenced the time spent of licensing, which again contributed to the delay in commercial operation date. The local constraints therefore contribute to raising transaction costs for small-scale hydro projects.

5.3.4 CDM costs

Manipi HEPP received final approval of 28 000 tons CDM quotas in May 2011. The quotas will be sold to carbon finance.

SMHP has outsourced the whole process of CDM application and verification to private, Indonesian consultancies[45] .The cost of outsourcing the process is close to fixed. The application costs USD 20 000 and the verification costs between UDS 10 000 and 20 000.

The next project[46] planned by SMPH is a larger hydro power plant (110 MW). The cost of getting CDM quotas for this larger project is not much higher than Manipi HEPP despite generating larger profits due to the larger amount of CDM quotas. The simplified procedures for small-scale projects in CDM do therefore not contribute to lowering the price for the application, charged by the consultancy. The transaction costs related to CDM therefore make up a significantly larger share of total costs for small-scale projects than for larger projects.

[45] Asian Carbon Indoensia.
[46] Bontu Batu HEPP, Enrekang Region, South Sulawesi.

5.3.5 Learning from doing and the way forward

Despite being profitable, and today actually proving more profitable than expected in the planning phase, Manipi HEPP was mainly intended as a "pilot" to learn from before investing in larger projects, where higher profits can be realized. Their experiences with transaction costs are however relevant for other hydro-projects, small or large:

Most important experiences

- Will continue to focus on the same area, South Sulawesi, for future projects because much of the work put down in making contacts and learning the institutional and legal system is region-specific and will only partly, be transferable to other areas in Indonesia.
- Will as far as possible avoid border-rivers and other avoidable choices that involve more than the unavoidable minimum number of actors involved. Continue to mingle with locals and maintaining good relations with authorities.
- Ensure financial closure in time.
- For next project: Budget for 15 percent "unexpected costs".

5.4 Summary of findings IPP experience

The findings from this brief case study of the IPP, Sulawesi Mini Hydro Power, did to a large extent confirm the most extensive transaction cost components. The most important findings can be summarized as:

- The TCs related to time and cost spent on information gathering, the *preparation phase* (Figure 5.2) proved to be less extensive than anticipated.
    - This experience was assumed to be a result of a long-term involvement in Indonesia and related branches in the "pre-early phase".
- Despite governmental aims to ease the legal requirements and licensing for small-scale projects in Indonesia, the *preparation phase* (Figure 5.2) proved more time consuming than expected.
    - Particularly affecting the cost overrun was the little accessible requirements for obtaining financial closure which delayed commercial operation date substantially.
    - Corruption and inefficient bureaucracy is a constant challenge, and can be a potential cost driver when trying to avoid illegal payments. The corruption

pressure is most difficult, and time consuming to handle during the licensing period because the IPP depends on getting these and can, if not taking the proper precautions have extremely weak bargaining power.

- From the experience of this particular IPP, the contact with PLN does not appear to be a big cost driver, but rather general slowness of the bureaucracy.

- Having well established and good contacts ease the problem with corruption and can speed up bureaucracy.

Because the SMHP investigated has not documented the amount of costs accruing in addition to production costs and capital costs (TC), the findings cannot reveal the amount of TC accruing for the various TC-categories. The experienced delayed commercial operation date and 20 percent cost overrun can however give an indication of the general TC level experienced by this particular IPP in small-scale hydropower development in Indonesia. The major reason for the cost overrun was reported to be the delayed COD. Three reasons for the delayed COD where emphasized: Flooding, problems associated with the financial crisis and delays. Out of the three main reasons for the experienced cost overrun, only the costs associated with the flooding does not fall into the category of TC. These costs accounted for approximately two percent. The remaining 12 percent of budgeted "unexpected costs" can therefore indicate the amount of TC that is likely to accrue, despite managing efforts. For this particular IPP the TC can seem to account for at least 12 percent of total project costs, because some TC where already taken by establishing the local contacts etc.

6 Discussion

The previous parts have outlined an alternative to a theoretical and methodological approach to treat transaction costs more directly. Part five has applied this approach to reveal more about the drivers behind high transaction costs for small-scale hydropower developers in Indonesia in general, and for one particular IPP within this sector. The following is a discussion of the conceptual implications of extensive TC on real life economics, and the importance of treating these costs more accurately. The discussion will hint towards TC reduction potentials.

6.1 Risk and transaction costs

Recalling the model "reduced transaction costs – reduced dead weight loss" from part 2.1.4 (copied below) more can be said about the relevance of TC after having investigated the case of IPPs in small-scale hydropower production in Indonesia.

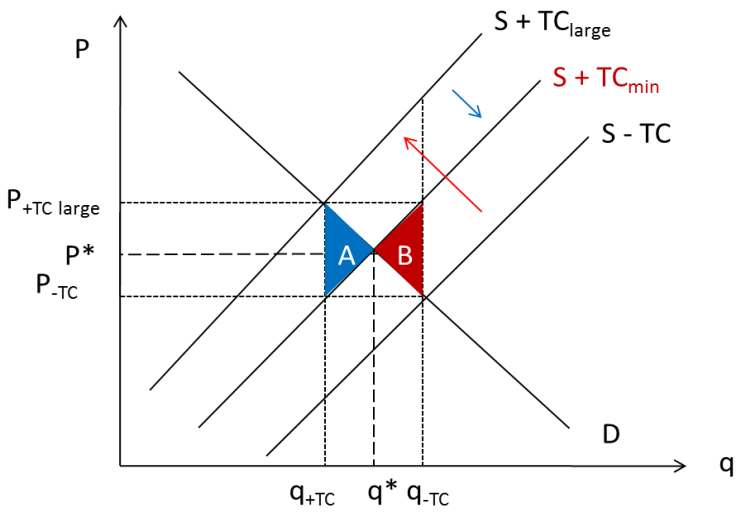

Figure 6.3: Transaction cost impacts, repeated

The model would indicate that where TC are not included (S –TC), too much would be produced (q_{-TC}). From the case of small-scale hydropower production it seems that this is not the case for the small-scale hydropower sector in Indonesia. Rather, the opposite is true; that too little is being produced compared to the demand. The can be multiple explanations for this, of which many are beyond the scope of this thesis. One explanation does however seem conceptually plausible given the TC theory presented and the findings from the Indonesian context. It can seem that rather than excluding TC (S – TC), potential project developers assume that the Indonesian small-scale hydropower sector is such a risky investment climate (there is assumed that costs will accrue in addition to production and capital costs due to the

context dependent institutions), that they add a risk premium (incorporated in high discount rates and IRR). Because this risk premium includes so many potential costs, it can easily be inaccurate. Suppose the risk premium can be expressed as the difference between S + TC_{min} and S+TC_{large} in figure 6.1, so that S + Risk premium = S+TC_{large}. In this case, too little would be produced, compared to optimal allocation. Because of the inaccuracy of a risk premium containing (too) much this could potentially even further reduce amount produced as illustrated in the figure 6.2 below:

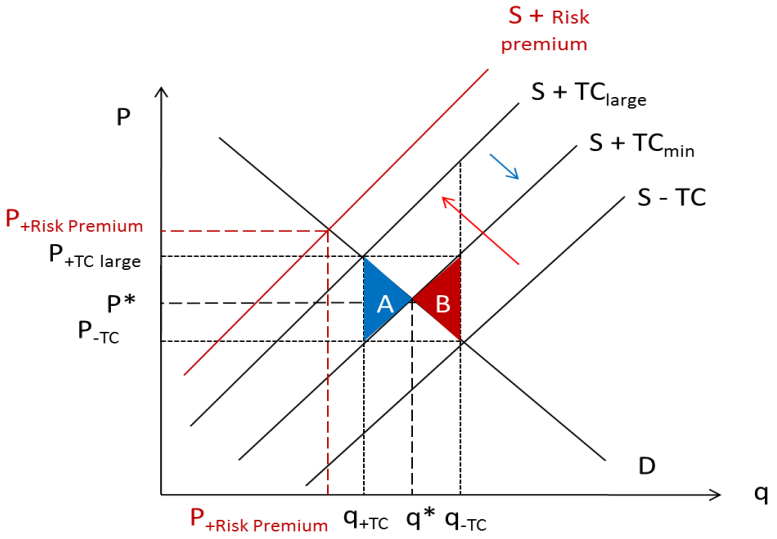

Figure 6.4: The impact on resource allocation from supply denoted by excessive risk premium

Figure 6.2 illustrates a case where the risk premium is set too high and less goods, for example power from small-scale hydro is produced than optimum, q*. When little quantified data exist for the cost arising from the country specific risks, this level will itself face the risk of being inaccurate. This could be the case for the small-scale hydropower sector in Indonesia given that few investors are keen on entering, despite proven profits from those doing so, as the IPP investigated in this thesis. Failing to identify more accurate knowledge of TC can therefore threaten the development of otherwise beneficial projects. This can have a severe real life impact both on a macro and a micro level. For the case investigated, the failure to treat TC could potentially threaten the realization of Indonesian electricity sector targets such as increased electrification ratio and increased share of renewables. For the private investor, this could potentially mean restrain from investments that could have been profitable.

As is evident from the argument above, and more generally for the argumentation throughout this thesis, TC are closely linked to risk. In many cases it can be difficult to distinguish TC

and risk, because most TC derive from what is normally termed risk. Despite this, it is not trivial whether the costs accruing in addition to production and capital and production costs are treated as risk or TC. If we return to the case where the S+ risk premium = S + TC_{large} this would not be the optimal level, but the same level as would have been the result of mapping TC occurring for a particular investment context, equal to the previously mentioned "step one" in TC management. As described in chapter 2.1.4 mapping TC occurring would not necessarily reduce total dead weight loss, if not followed up with measures to reduce the identified TC where possible (the gap between S + TC_{large} and S+TC_{min}), "step two" in TC management. Here is where the advantage of treating TC as independent cost variables, over incorporating them in a risk premium (through higher discount rate or required IRR) becomes clearer. SupposeTC are mapped more detailed with identified cost drivers and extent. Then one will more easily be able to identify which of the TC are avoidable. Measures to reduce these can then, more easily be taken and DWL reduced when moving towards S+$TC_{min.}$

An additional point highlighted by Purra (2010) is that the TC drivers may belong to other categories of costs than those normally used as standard operational risk variables, so that potentially big costs, and reduction potentials, are not identified if "hidden" in the much-embracing risk premium.

6.2 Context independent TC categories and context dependent data

The problems experienced when seeking to quantify the extent of each TC category and to rank them more or less extensive than each other in this thesis doesn´t come as a big surprise, as this is considered the main challenge of treating transaction costs. This does however, not mean that it is impossible to ever obtain more detailed information about the average cost of various TC components. If more datasets like Doing Business and The Global competitiveness Index existed, also for specific sectors, much more would be known about the average time and cost associated with transactions across various countries and sectors. The demand for data like this proves the importance of costs that accrue in addition to production and capital costs, transaction costs. The advantage of such collective data bases are that the same TC categories are used across various contexts so that comparisons are made possible. This would make investment decisions smoother in that comparisons between countries to invest in, could be made based on more cost components (both production costs and TC) and investments could come closer to being done where most benefits can be realized at the lowest cost.

6.2.1 Context dependency and multidisciplinary TC management

The one finding that stood out from the case study of this thesis was the importance of local knowledge and attachment, including long-term presence in Indonesia in keeping TC as low as possible. Particular context knowledge was therefore crucial in both two steps of TC management. First; when identifying what the major TC drivers were, and second as a tool in reducing these. At least for the case investigated this proves that quantitative data, like the kind provided by *Doing Business* and similar datasets would only partially facilitate effective TC management. The two steps of TC management therefore seem to require multidisciplinary skills beyond classic economic cost reduction strategies. Both steps of TC management require knowledge of the institutions that are touched upon in the transactions required for making the investment. The more is understood about the institutions, the easier it becomes to identify and manage the risk and associated costs. Incorporating TC more specifically in cost analysis is a better way to manage risk. Acknowledging this broadens the field of economics and the methods required for managing profitable investments.

6.3 All cash flows matters

The most important perspective of the investor is the flow of costs and benefits related to the project (NPV). Expected profitability is the key in decisions regarding investments. This implies that as real life economic outcomes can be flawed if not accepting and treating positive TC, outcomes can be equally flawed if considering solely the TC for a particular context. Optimal allocation is where the bundled sum of construction and transaction costs are reduced as much as possible. This was emphasized in the IPP case study in this thesis. Despite having larger TC when operating in Indonesia, the general cost level made construction cost lower than alternatives and the sum of costs is less than alternatives. This aspect has further relevance when seeking to reveal the most extensive TC drivers. The IPP case study revealed that the biggest share of TC derives from delayed COD, rather than the actual spending on transactions. When investing in a country with comparatively low cost-level, costs accruing from licensing, outsourcing CDM application etc. do not make up a big share of total costs. On the other hand, when profit inflow is delayed and capital costs increased due to delayed COD (caused by slow transactions), this makes up a big share of TC.

Focusing on (all) cash flows can further give an indication of whether or not the DWL losses are greater than the costs expected to accrue for initiating TC management (remember the figure 2.5 “TC and Precision”). If cash flows are traced and it is revealed that a substantial

share of total costs are neither production nor capital costs; substantial TC are accruing, and profits can be realized by decreasing these.

6.4 Potential for reducing transaction costs

Many of the perceived TC drivers are related to the formal and informal ways Indonesia, and the electricity sector in particular, functions. For the majority of cost drivers, there is little that private investors or project developers can do change this institutional set-up. Since the emphasis of this thesis is on private investor, the main focus will be on TC factors that they can actually affect.

6.4.1 Economies of scale

For the case investigated, the impression of the informants and the IPP was that the general slowness of the bureaucracy, heavily influenced by lack of transparency and the problem of corruption, was a greater determinant of TC level than amount of required licenses and other formal requirements that could have benefitted smaller project developers. Long-term presence in Indonesia and the particular context of the project to establish good local relations was seen as the best way to reduce TC. The findings of this thesis indicate that TC are to some extent fixed, meaning that they do not increase by the size of the project. The following suggested reduction measures are therefore all some kind of economies of scale measures. The following is not a throughout discussion of ways to reduce TC, but rather hints towards ways to reduce high fixed TC for the case of small-scale hydropower in Indonesia and similar cases with high fixed TC.

6.4.2 Larger projects

When TC are high and fixed, the most obvious way to reduce marginal TC/TC share of total project cost is to go for larger hydropower projects than small ones to realize economies of scale. My findings indicate that this is the case in Indonesia. When the overall profitability on larger hydro is higher than for smaller projects, private investors will, unless other incentives are given, develop the available capacity for larger hydro before they look at small-scale hydro.

6.4.3 Learning effects

For individual investors, mapping of TC accruing (both drivers and amount) of previous projects in similar contexts can be used to make more accurate estimates of TC, $\widehat{TC}$ (formula 2.2) for future projects:

$$NPV = -I + \sum_{t=t_0}^{\widehat{t_{COD}}} \beta^t \, \widehat{TC}_t + \sum_{t=\widehat{t_{cod}}}^{T} \beta^t (B_t - C_t)$$

(2.2 repeated)

Before COD *Beyond COD*

When a series of investments are taken within the same context, the second, and following investments benefit from knowing TC drivers, levels and how to reduce them so that less TC will accrue for these projects

For the IPP investigated in this case study, this was their strategy in making a small-scale hydro as a "pilot" for future investments in the same area and sector later. The *learning effect* can therefore reduce TC, when part of a strategy of bundled investment within the same institutional context. The concept of bundling different projects as one project is called *programmatic approaches*. Programmatic approaches are particularly interesting when looking at how to reduce TC for small-scale projects, such as small-scale hydropower in Indonesia.

6.4.4 Programmatic approaches and small-scale projects

Small projects cannot easily take advantage of economies of scale. This appeared to be the situation also for the case investigated in this thesis. Small-scale hydropower projects were perceived to have higher per unit transaction costs because total TC wore close to fixed. A possible approach to reduce marginal TC could be to implement a number of small-scale projects within more or less the same institutional environment, in what can be termed a *programmatic approach.*

The idea behind a programmatic approach TC is to create economies of scale benefits also for smaller projects through systematic knowledge transfer and bundling between similar projects. Programmatic approaches therefore combine the two previously mentioned reduction measures of learning effects and economies of scale.

The CDM has already incorporated the principle of programmatic approaches through the Program for Acitivites (PoA). Through PoA, small-scale developers are allowed to bundle similar projects together in one single CDM application in order to reduce marginal TC (UNFCCC EB 32).

For the particular IPP investigated in this thesis, PoA could have been used if the second project were a small-scale project as well. Marginal TC for CDM could have been reduced,

and the perspectives for more small-scale projects improved. The logic behind programmatic approaches considering reduced TC can be used also where formal incentives such as PoA do not exist. The investment strategy of the IPP investigated, where they have chosen to focus all their projects in the same area, is another use of the idea of programmatic approaches. When looking broader than one particular IPP, the idea of programmatic approaches can possible be used to lower TC for small-scale more generally. Two keys would be to facilitate more systematically knowledge transfer and to look for small-scale development were more projects can be realized within similar institutional contexts. This way of thinking could possibly be one step towards scaling up small-scale.

7 Conclusions and recommendations for further research

The main purpose of this thesis was to give an idea as to the level and importance of private-borne TC. The case study has revealed some more in-depth knowledge about the drivers behind TC for the particular case investigated. Furthermore it has given some indications about the more general value of treating TC more directly.

7.1 Inference and conclusions from the Indonesian case

This case study of IPPs in small-scale hydropower development in Indonesia support previous research, indicating high TC for small-scale hydropower projects in developing countries. Consistent with previous research, it appears that TCs are higher in developing countries where investment risk is perceived high, and in sectors and areas which require interaction with many stakeholders. This thesis aimed at obtaining a more detailed understanding of transaction cost components for the case investigated, seeking to answer:

> *RQ 1: What is the extent of the three categories of transaction costs (1 Information gathering, 2 Contracting, and 3 Local constraints) in the case investigated?*

For the general case study, it was revealed that the three categories of transaction costs were perceived as extensive. The findings could however not be used to rank the three categories more or less prevalent than each other because of their interdependency and overlap. What became evident was that the most extensive TC component was the general slowness of the Indonesian bureaucracy, highly influenced by a blurry regulatory framework and high corruption level. For the particular IPP investigated, an overlap between the three categories was also the case. These findings indicated that the total TC for Sulawesi Mini Hydro Power contributed to more than 12 percentages of total costs.

In trying to get a more in-depth understanding of TC components, this thesis has searched for other cost drivers, therefore investigating:

> *RQ2: Are there other types of transaction costs, like time delays, that also contribute to high TCs in the case investigated?*

The case study revealed that time delays were perceived to contribute to the biggest share of total TC. Delayed commercial operation date, again caused by delayed transactions across the three operationalized categories where perceived to be the most crucial TC driver by the particular IPP investigated.

When investigating the case of small-scale hydropower developers the question over whether TCs are fixed or variable is important. This thesis has therefore aimed at answering:

> *RQ3: Are the majority of transaction costs fixed or variable, and how does this affect the perspectives for small-scale hydropower development in Indonesia?*

My findings indicate that relationships with the relevant government official was a greater determinant of TC level than formal requirements such as the number of licenses or access to information. This aspect is linked to the features of Indonesian business culture which is said to value personal relations over company relations and appreciation of long-term commitment. Effective transaction cost management in the case investigated, therefore requires dedication and time spent early in the process to establish the contacts needed for successful further transactions. This appears to be vital for the realization of the project. The cost of this has not been possible to quantify, but statements from respondents bear witness that this is a costly process. The necessity for long-term commitment prior to project initiation reduces the expected profits. The cost of establishing contacts appears independent of project size and poses a greater economic burden to smaller projects.

Indonesia is struggling to attract foreign IPPs to the electricity sector, and more so to small-scale projects. The perceived high investment risk and associated TC is one reason for this. Although there are examples of IPPs making profits in this sector, many are hesitant to enter Based on this observation, my last research question was:

> *RQ4: Is effective transaction cost management a determinant for whether small-scale hydro power production becomes profitable for independent power producers in Indonesia?*

Relations with government officials and other stakeholders was revealed as one determining factor for TC level, meaning that if done successfully it could also be a an effective tool in TC management for the case investigated. There can however be many reasons why some projects experience success where others fail, and why the Indonesian hydropower sector and particularly small-scale hydropower fails to attract IPPs. It is therefore not possible to say anything unequivocal about the reasons for this. Other costs than production and capital costs do however seem to be extensive and dependent upon active management. Whether this management can in fact be the breaker or maker of profitable projects, is worth more research.

7.2 General conclusions

Perceived high risk appears to be one important reason for the failure to attract more IPPs in the Indonesian case. For this case and others, most TC components can either be called TC or risk. The more is taken out of the risk and included as cost variables, the more certainty about costs and possibility to reduce these will be obtained. Whenever high TC occur, taking measures to identify and reduce them in a two-stepped TC management can reduced dead weight losses and increase profitability.

TC management can be costly for small-scale projects and for single-projects. Because much of the TCs are fixed, TC can be reduced if using programmatic approaches. If a series of bundled projects, large or small are conducted within the same sector and similar institutional context, the marginal TC will be reduced and contribute to a smaller share of total costs.

7.3 Further research

Further research is needed to fill the gap between theoretical and empirical use of transaction costs. Butter (2010) has emphasized the need for a clear and operational classification of the various forms of transaction costs as a first step in this process. Transaction costs can then be more easily separated from production costs, and quantified to prove the importance of TC, both for individual firms and countries. Sector and country specific documentation of TC can ease the process of managing TC, and empirical studies treating TC can therefore help fill this gap.

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Abbreviations

CDM	Clean Development Mechanisms
CER	Carbon emissions reductions
COD	Commercial operation date
DB	Doing Busniness
DGEEU	Directorate General of Electricity and Energy Utilization
GHG	Greenhouse gasses
GW	Giga Watt
HEPP	Hydroelectric power plant
HSAF	Hydropower Sustainability Assessment Forum
IPP	Independent power producers
IRR	Internal rate of return
MW	Mega Watt
MW	Mega Watt
NIE	New Institutional Economy
NPV	Net present value
OSS	One-stop shops
PLN	Perusahaan Umum Listrik Negaraa
PPA	Power Purchase Agreement
RE	Renewable energy
RES	Renewable energy supply
RET	Renewable energy technology
SME	Small and medium sized enterprises
SMHP	Sulawesi Mini Hydro Power
TC	Transaction costs
TCE	Transaction costs economy
WB	The World Bank

Appendices

APPENDIX I: List of interviews conducted

NAME	TITLE	INSTITUTION	DATE AND PLACE
Dr. Terry Lacey	Independent Journalist and advisor	*Jakarta Post etc.*	March 28th. 2011, Jakarta
Drs. R. M Sodejono Respati	Chairman	*Solar Energy Focus Group, Indonesian Renwable Energy Society*	March 28th. 2011, Jakarta
Fabby Tumiwa	Executive Director	*Institute for Essential Services Reform (IESR)*	March 29th. And 31the, Jakarta
Eivind S. Homme	Ambassador	*Royal Norwegian Embassy, Jakarta*	March 29th. 2011, Jakarta
Constantin N. Karame	First Secretary		
Dr. Irhan Febijanto	Ass. Deputy and RE-Researcher	*Badan Penkajian Dan Penerapan Teknologi (BPPT)*	March 29th. 2011, Jakarta
Agus Sari	President Commissioner, Non-Executive Director	*Iklimkarbon*	March 29th. 2011, Jakarta
Hari Yuwono	Project Development Officer	*Private Financing Advisory Network, CTI, PFAN (The World Bank Group)*	March 30th. 2011, Jakarta
Anders Cajus Pedersen	Advisor	*Mini-hydro Power Project for Capacity Development (MHPP), Deutche Gesellschaft für*	March 30th. 2011, Jakarta

		Internationale Zusammarbeit (GIZ)	
Timothy H. Brown	Natural Resource Management Specialist	*The World Bank*	March 31th. 2011, Jakarta
Ishmid Hadad	Chairman	*The Working Group on Financial Mechanisms – National Council on Climate Change*	March 31th. 2011, Jakarta
Arnfinn Jacobsen	Technical Adviser	*IndoPacific Edelman*	March 31th. 2011, Jakarta
Knut Fossum	Managing Director	*KF Gruppen AS*	May 9th. 2011, Oslo
Tor Syverud	Managing Director	*Tinfos AS*	May 12th. 2011, Oslo

APPENDIX II:
Regulatory Framework for Promoting Renewable Energy Development in Indonesia.

Regulations Contents	**Regulations Contents**
National Energy Policy (Presidential Regulation No.5/2006)	Target for 2025 1) Energy Elasticity to be less than 1 2) Energy Mix (share of new and renewable energy (RE) to be 17%)
Law of Energy （No.30/2007）	1) Issuance of presidential regulation on new and RE 2) Promulgation of National Energy Council (DEN) 3) Promulgation of National Energy Plan (RUEN)
Ministerial Regulation (MEMR) No.31/2009	Purchasing Tariff for PLN from Renewable Power Plant Voltage of interconnection: 1) Medium Voltage: 656 Rp/KWh×F 2) High Voltage: 1004Rp/KWh×F where F stands for island specific load factor F=1.0 for Java and Bali, F=1.2 for Sumatra and Sulawesi, F= 1.3 for Kalimantan, East and West Nusa Tenggara, F=1.5 for Maluku and Papua
Ministerial Regulation (MEMR) No.32/2009	9.7cents/KWh as the ceiling purchasing tariff for PLN from geothermal-based power
Ministerial Regulation (MOF) No.24/2010	1) Income Tax Facility (5% reduction of net income per annum for 6 years) 2) Value Added Tax Facility (exemption of VAT on imported RE machines and equipment) 3) Import Duty Facility (exemption of import duty)

Source: Fukuda and Siagian 201