

# SUCCESS FACTORS FOR THE EFFECTIVE IMPLEMENTATION OF RENEWABLE ENERGY OPTIONS FOR RURAL ELECTRIFICATION IN INDIA – POTENTIALS OF THE CLEAN DEVELOPMENT MECHANISM

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## ABSTRACT

Developing countries as well as international development assistance have for a long time aspired to combat energy poverty in rural areas of developing countries. However, until now a major part of national and international public and private attempts to provide affordable and stable energy supply have failed due to various economic, political, social and institutional obstacles. Embedded in the global context of the international climate change regime, the Clean Development Mechanism (CDM) of the Kyoto Protocol constitutes a new option to deliver energy for rural electrification.

The main objective of this paper is hence to examine the context conditions and factors determining the effective application of renewable energy options for rural electrification in a developing country context, namely India, taking the CDM as an example. Applying comparative case study research methods to the analysis of CDM biomass projects in the context of four selected Indian states allows for the conclusion that socio-political and historic framework conditions matter for the implementation of new renewable energy options.

## Keywords

Rural electrification, renewable energy, governance, context conditions, Clean Development Mechanism, India

## INTRODUCTION

As energy supply plays such a fundamental role in development processes, paying attention to the conditions under which new delivery options are successfully applied is tremendously important. The central argument of this paper states that particularly the governance context matters and determines how, to what extent and with what impacts energy supply options are implemented.

Energy is acknowledged a basic human need. Developmental statistics confirm a strong correlation between energy consumption and economic development (TERI 2004). The critical issue of energy access and accessibility for sustainable development has been discussed on international level ever since the Stockholm Conference in 1972.

In a global comparison, India alone hosts 35% of the world's population without access to electricity (Ailawadi, 2006). Furthermore, projections about India's energy future reveal an exponential increase in per capita energy consumption driven by population growth and economic expansion. In summary, this raises questions not only about energy security in general but also about the equitable distribution of energy access and supply in particular.

Renewable energy options are promoted in order to achieve the objective of energy supply for rural electrification. The fact that about 72% of Indian households rely on traditional forms of energy for their electricity needs (Ailawadi, 2006) implies an enormous potential for electrification based on clean, renewable energy technologies. However, a history of national and international efforts not finding hold or failing in many Indian states raises the question of what conditions are necessary to successfully integrate options for rural electrification in India. This becomes particularly relevant in the light of introducing the Clean Development Mechanism (CDM), i.e. the Kyoto Protocol's project-based flexible instrument, as a potential for renewable energy supply in Indian states (Banerjee, 2005).

Lessons learnt from past decades of national and international responses to rural energy needs emphasise the central role of 'good enabling conditions' (World Bank, 1996). The hypothesis deduced hence argues that regardless of how and by whom electricity is supplied, certain policy, economic and developmental framework elements are crucial for the success of rural electrification in the different union states.

In the following, after reviewing the context for rural electrification in the light of innovative approaches such as the CDM, certain context condition will be examined for selected union states. This will allow for assessing the impact of situational factors on the establishment of new governance mechanisms such as the CDM to deliver on energy needs in rural areas.

## **RURAL ELECTRIFICATION IN THE INDIAN CONTEXT**

In the Indian context, an average annual growth of 8% is envisioned as a prerequisite for employment and poverty reduction {India Government, 2004}. However, this vision is challenged by the facts that only 55% of the population benefit from interrupted electricity access, that governance institutions and procedures in the power sector are deteriorating and that circumstances in rural areas are aggravating {Haanyika, 2006}.

Rural electrification is widely acknowledged as determinative for improving general living conditions and economic development {Chaurey, 2004}. The manifold consumptive and productive applications of electricity reveal ramifications to other developmental issues such as child labour, gender inequalities and migration {World Bank, 1996}. Electricity does not only improve the quality of life but also entails productive uses that increase income and provide development benefits to rural areas {Martinot, 2002}.

Rural electrification in developing countries faces unique challenges {Haanyika, 2006}. The reasons why rural electrification has progressed slowly are amongst others institutional weaknesses and limited financing that discourage private investors from the delivery of energy services to rural areas. Problems related to energy supply through electrification in rural areas of India emerge due to the relatively high infrastructure costs of extending the grid to remote areas. Apart from issues such as the affordability of energy and the willingness to pay, the dismal quality of energy services {Haanyika, 2006} due to theft and leakages constitutes another challenge in poorer regions.

Resulting from these observations, rural energy systems must be economically efficient, needs-oriented, equitable, empowering and environmentally sound {Reddy, 1999} in order for electrification to be developmentally and environmentally sustainable. This puts a lot of pressure not only on the design and establishment of new electricity options but also on the underlying conditions shaping the context for rural electrification {Coninck, 2005}. Current debates {Coninck, 2005} argue that the state policy approach to energy markets, the relation to state development and other policies and planning, the availability of central or state financing schemes, organisational and regulatory issues and the role of and support to non-governmental and private bodies constitute decisive factors.

With regard to the Indian context, achievements of rural electrification to date are rather dismal with still 56% of rural households without electricity access (Ministry of Power, 2004), rising transmission and distribution losses, and declining cost recovery despite increasing rural electricity subsidies {Modi, 2005}.

The history of rural electrification in India dates far back to shortly after Independence, and rural electrification has constituted the long-term objective of Indian governments since. However, electrification strategies as central elements of each consecutive Five-Year-Plan shifted from an extensive approach related to grid extensions to a more intensive and integrated strategy {Modi, 2005}. The 8<sup>th</sup> Five-Year-Plan focussing on grid extension solutions also started to consider renewable energy applications. Yet, even nowadays the central government's emphasis is still on grid solutions as the preferred option {Bradley, 2005} due to the advantages of virtually no capacity limits and more reliable and extensive power sources. Stand-alone applications and renewable energy options are to be considered as second-best alternative only for cost-efficiency reasons and in order to encounter mounting structural problems {Coninck, 2005}.

The 2003 Electricity Act integrates these two approaches. Setting out electricity supply to all areas as statutory obligation foresees additional enabling mechanism for service provision to rural areas {Banerjee, 2006}. The current 11<sup>th</sup> Five-Year-Plan renders rural electrification and power sector reforms high-priority developmental objectives. Additionally, the Ministry of Power launched a new strategy for the creation of facilitative institutional mechanisms {Modi, 2005} in order to promote on- and off-grid electricity supply. Mid-2005, the Indian government launched a rural electrification programme that concretely aims to provide electricity supply to 125.000 villages by 2007 and to 78 Million households by 2012 {Bradley, 2005}.

In summary, despite government efforts to integrate rural electrification into Five-Year-Planning, power services and the state of energy service providers is still characterised as depressed especially in rural areas {Modi, 2005}.

Important agents for rural electrification historically comprised local enterprises, local government and public-private partnerships (PPPs) with a tendency towards increased local private or quasi-private ownership in the 1950/60s {World Bank, 1996}. This was followed by a period of public ownership of national electricity authorities. Since the 1980/90s privatisation and the unbundling of electricity authorities have taken place in the course of economic liberalisation. In summary {Reddy, 1999}, whereas historically local community initiatives and control were predominant for rural energy supply, ensuing government initiatives for providing infrastructure and bureaucracy have now been partially displaced by the market.

Given the scarcity of non-renewable resources and the shortcomings of conventional electrification, the potential of renewable energy sources for rural energy supply is held in high esteem {Haanyika, 2006}. However, renewable energy resources require efficient and adequate technologies, knowledge and capacities for operating and maintaining the respective technology systems.

With regard to India, the current share of renewables in the overall energy mix is averaging 5% with wind as the most important resource followed by biomass and solar (Ministry of Power, 2004).

Advantageous conditions for applying renewable energy options arise due to the vast geographical extension of the areas to be electrified, the dispersed and scarce settlement structures and the costly and inefficient transmission losses {Reddy, 1999}. Furthermore, renewable energy options are oriented towards concrete local demands and usages. Since renewable energy technologies are based on local resources, overall material costs are minimised. Crucial costs, however, result from acquiring and establishing these systems. Additional challenges to renewable energy options relate to the lack of knowledge, information and capacity to use and maintain the installations.

However, despite political attention and many demonstration projects and schemes, renewable energy options have so far not been part of holistic energy planning. Government efforts such as biogas programmes for the installation of household plants reveal a dismal record of 30% of the reported systems not operational any longer. Factors such as lacking local capacity and knowledge as well as insufficient business skills and financing to develop markets and products explain this outcome {Martinot, 2002}. With regard to decentralised applications, main challenges to be tackled are the facilitation of technological know-how transfer and business models for efficient productive and consumptive uses {Martinot, 2002}.

In summary, using renewable energy sources such as biomass for grid-based power generation to contribute to rural electrification sounds promising on the one hand because of the ubiquity of natural resources. But on the other hand, this depends on the competition with conventional electricity generation, tariff structures and grid accessibility in general {Reddy, 1999}. New energy solutions are thus confronted with political and institutional hurdles, various energy-pricing and subsidy policies and insufficient budgetary support that impede the leapfrog of renewable energy technologies from deployment and demonstration levels to fully commercial application stages.

Over the last decades, international development assistance has come to support the application of renewable energy options in rural areas as well. By the late 1980s, however, this culminated in a general disappointment related to the failure of many attempts to reach commercialisation stage or self-sustenance, which parallel Indian experiences. Reasons {Martinot, 2002} for the shortcoming to demonstrate institutional and commercial viability amount to poor technical performance, lacking suitability to user needs and local conditions, as well as insufficient mechanisms for equipment maintenance, and lacking access to credit and expertise.

In conclusion, so far, government and international donor efforts to install renewable energy options in rural areas are characterised as incremental since they lacked institutional and policy support, sustained efforts and local ownership {Sharma, 2006}.

In this context, the introduction of the Clean Development Mechanism (CDM) as one of the flexible instruments of the Kyoto Protocol induces a market-based approach to potentially tackle the problem of rural electrification through the delivery of renewable energy options. Yet, in the light of the analyses above {Martinot, 2002}, it is argued that the CDM's success as sustainable renewable energy option and its impacts on rural development depend on the context conditions i.e. facilitating circumstances.

## **POTENTIALS OF THE CDM FOR RURAL ENERGY SUPPLY**

Under framework of the Kyoto Protocol several instruments are provided to achieve the common objective of reductions in greenhouse gas emissions (GHG emissions) in order to mitigate climate change. The Clean Development Mechanism (CDM) constitutes one of these flexible means for complying with internationally agreed reduction targets. Characteristically, the CDM constitutes a project-based market mechanism of trading certified emission reduction rights (CERs) acquired through the implementation of mitigation projects resulting in net GHG reductions in Non-Annex-I countries. For example, setting up a renewable energy project in India generates CERs that contribute to offsetting the investors' GHG reduction obligations. However, the CDM is not only introduced to assist Annex-I countries in meeting emission reduction obligations but also to involve Non-Annex-I countries in the international climate change regime through the delivery of sustainable development benefits.

In the global context, India belongs to the 'big players' on the global carbon market. This means that in terms of CDM investment, most projects are indeed established in India (Fig. 1). However, this does not imply a parallel investment value since the greatest number of CERs is generated in China. This is explained by the sectoral concentration of CDM projects in the field of renewable energy in India. Due to the small scale project size they do not generate many CERs but nevertheless trigger the more sustainable development benefits. The current CDM pipeline (UNEP Risoe, 2007) speaks of a total of 553 projects in India that is 35.3% of the projects worldwide generating some 18.2% of the global CERs.

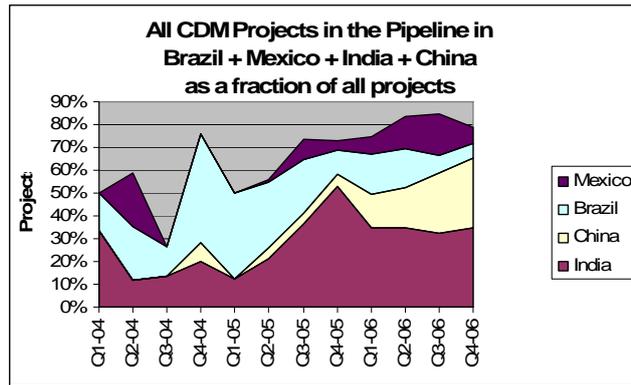


Figure I: CDM Projects 02/2007

Scaling down even further, within the renewable energy sector biomass co-/generation and gasification by far take up the largest share of CDM projects in India (Fig. II).

For this reason, biomass CDM projects constitute the comparative baseline for examining success factors and conditions for implementing renewable energy options. Additionally, the application of biomass for rural and local energy generation looks back at a long history and has been supported by national government as well as international assistance activities. Due to the ubiquitous availability of this resource and the compatibility of technologies applied, CDM biomass projects suggest some potential to provide for rural renewable energy supply.

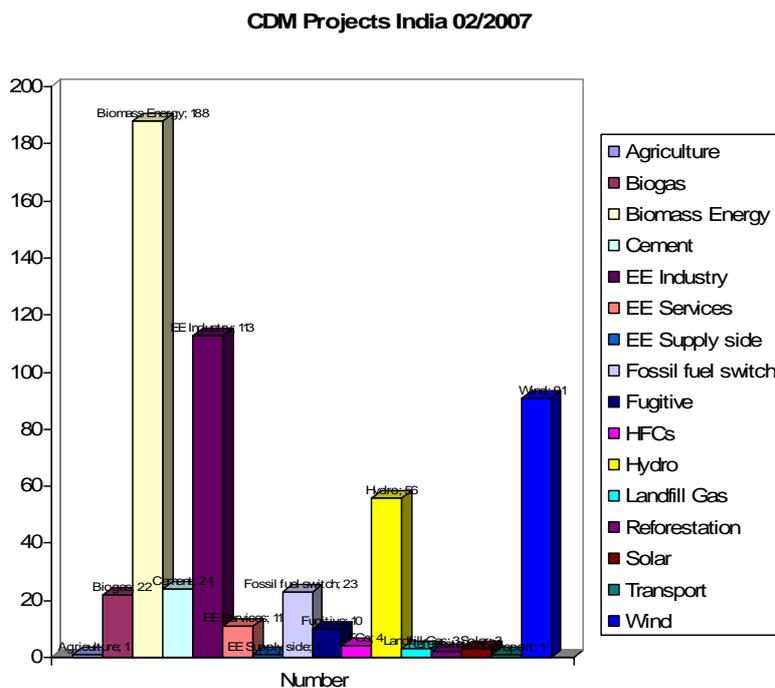


Figure II: CDM Projects India 02/2007

## CONTEXT CONDITIONS FOR INTRODUCING NEW APPROACHES

An understanding of policy decisions, processes and impacts in the field of rural energy supply in India requires a theory-based analytical approach. Political science perspectives explaining the puzzle of Indian democracy delineate the general framework for developments such as rural electrification. Thus, after a brief overview, governance concepts are taken up in order to develop hypotheses on the causal influence of distinct contextual conditions.

The characteristic feature of Indian democracy is that despite a deeply linguistically divided and multiethnic society a majoritarian type of democracy has been pertained since Independence {Lijphart, 1996}. Stable Indian context conditions are thus explained by the strength of government coalitions, representativeness and autonomy of linguistic and ethnic communities, and democratic intergroup/-state activism.

However, since the late 1960s tendencies towards a weakening of power-sharing are observed due to the mounting activism of several groups such as peasants. Election results show a clear shift from a dominant single- to a multi-party system. This is accompanied by increases in intergroup tensions and violence {Lijphart, 1996}. Particularly in the last years, exogenous influences of globalisation, economic deregulation and liberalisation have contributed significantly to the weakening of traditional nation state authority. In addition, this was accompanied by an endogenous weakening of central power and federalism {Pai, 2001}. This results from the regionalisation of politics and the party system, the upsurge of autonomy movements and demands, and the substitution of state functions by agents claiming a state failure to deliver on developmental objective.

Generally speaking, India still belongs to one of the few societies in transition in the developing world that reveals durable, adaptable and innovative institutional features in the overall governance system {Mitra, 2006}. This is the result of a strategic thinking by governance elites and the successful balancing act of decision-makers as brokers between a modern state and a traditional society. However, despite these significant features relating essentially to the central level, a variation of governance exists between the union states. This implies that the context conditions for any kind of policy or intervention are different and vary from state to state.

Observing the rapid industrialisation of Asian Tiger states, Neo-Institutional Economics proclaims a shifting emphasis from a non-interventionist, bureaucratic state to a developmental, accommodative state characterised by 'good governance'. This means that while government's role in the 1950/60s was to provide infrastructure and to tackle balance-of-payment problems, the 1980/90s saw a shift towards strategic government interventions and economic politics {Basu, 2002}. The empirically-observed shifts from strong government before the 1980s to less interventions throughout the 1980s towards more cooperative governance arrangements entail implications for the conceptualisation of context conditions {Pai, 2001}. Neo-Institutionalism in conjuncture with governance approaches thus allow for deducing hypotheses on governance features within union states. This is based on the assumption that a political system characterised by good governance conditions provides the appropriate context for sustainable development. Thus, different state and governance features have over time been identified as crucial for providing these facilitative circumstances that impact on the establishment of new development options, i.e. the CDM for rural renewable energy supply:

Firstly, an ideal governance context {Mitra, 2006} is characterised by trust and little elite fragmentation based on a constitution that protects core values and symbols. This is summarised in a first hypothesis:

#### **1) Constitution of political system**

The set up and restructuring of government institutions as well as the politics in the relevant sectors influence the ease and success with which new approaches are established.

Secondly, significant parameters determining the governance context comprise the bureaucratic state mechanism and the possibility of other actors to contribute to agenda setting. The second hypothesis thus focuses on the management of the political system:

#### **2) Political system management**

An effective set up and working of new approaches depends on the efficiency and responsiveness of public administration and bureaucracy.

Thirdly, while priority on the one hand is accorded to legal framework and public sector administration giving rise to the third hypothesis; on the other hand, softer issues such as accountability and participation were acknowledged later on and account for the fourth hypothesis:

#### **3) Regulatory and legal framework**

The transparency and predictability of state administration is based on a functioning judiciary, institutionalised redress procedures and transparent policy making.

#### **4) Civil society participation**

Guaranteed participation in elections and democratic processes as well as freedom of the press informs the public and hence renders government and the political system accountable and legitimate.

A fifth important element is inherent in the credibility of sanctions, laws and orders which takes expression in the manner the state deals with citizen complaints and redresses and becomes explicit in the human rights situation:

### 5) Human rights situation

Decisions to set up and sustain approaches to deliver certain governance functions are influenced by the extent to which the freedom of religion and the protection of minority are upheld since violations likely results in state-directed violence.

Apart from areas like the rule of law and human rights, central aspects relate to economic management and public service delivery, which gives rise to a sixth hypothesis:

### 6) Economic system

Factors such as the protection of property rights and competition constitute crucial investment conditions for the set up of new market-related mechanisms.

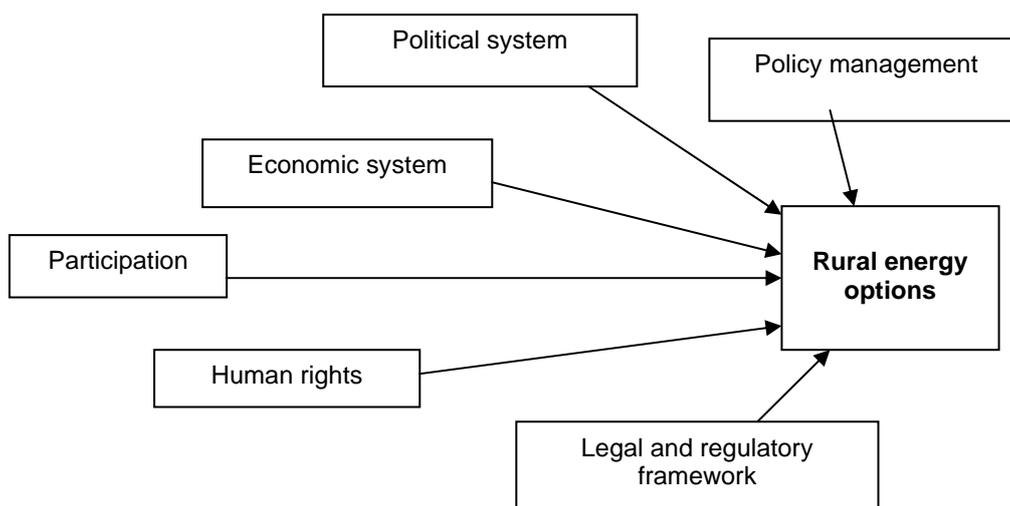


Figure III: Impact of Context Conditions – Theory Model

Taking up governance discourses, hypotheses regarding the impact of context conditions for developmental action such as introducing new mechanisms for energy supply have been elaborated (Fig. III). On this basis, the context conditions for CDM projects will be empirically examined with focus on selected Indian states. In conclusion, empirical and theory-induced observations argue that better governance quality inherent in the context conditions will lead to overall better development outcomes {Basu, 2002}.

## DISCUSSION: GOVERNANCE IMPACTS ON THE CDM DISTRIBUTION IN INDIAN STATES

Due to the shortcomings of rural electrification, energy poverty constitutes a serious challenge to rural development. New approaches to electrification by introducing options for renewable energy supply in rural areas hence encounter crucial development needs. Consequently, knowledge about context conditions necessary and required to attract new applications is of essential importance in order to sustain new solutions.

Projects under the Clean Development Mechanism (CDM) as a market-based project mechanism to deliver energy services to rural areas using renewable resources, e.g. biomass, are unevenly geographically distributed between Indian states (Fig. IV).

State	% of CDM biomass projects
<b>Tamil Nadu</b>	<b>7.5</b>
<b>Maharashtra</b>	<b>3.8</b>
Rajasthan	9.4
Karnataka	11.3
<b>Punjab</b>	<b>18.9</b>
Madhya Pradesh	1.9
Chhattisgarh	9.4
<b>Andhra Pradesh</b>	<b>32.1</b>
Uttar Pradesh	3.0

Figure IV: CDM biomass distribution in India

In order to understand crucial determinants for the application of new approaches, the governance context of the two states Punjab and Andhra Pradesh with numerous CDM projects as well as of Tamil Nadu and Maharashtra with very few CDM projects will be analysed (Fig. V). Additionally, elements indicative of the governance situation will be discussed in respect to the actual distribution of CDM projects. The main objective is to find out whether certain context factors can be distinguished that explain the CDM project distribution in the selected Indian states.



Figure V: Map of India (Source: <http://www.maps-india.com/india/index.html>)

A first glance at developmental statistics (Table 1) reveals that Andhra Pradesh (15.77%) and Punjab (6.16%) have the lowest incidences of population below the poverty line while hosting most of the CDM projects. While Andhra Pradesh also displays high economic growth, the other three states are in a moderate range. This might already suggest that socio-economic factors matter for the CDM project distribution.

However, Kohli (1990) claims that the nature of political party organisation and the pattern of power distribution determine governance patterns at state level. Summarising his arguments, not so much developmental indicators as rather the political and societal processes and structures of accommodating different citizen demands play a decisive role in framing the governance context. With regard to the impact of context conditions on governance, governance factors are hence influenced by the will and the capacity of regional governments. In order to gain an understanding of the underlying determinants, features such as law and order, the regional political culture, traditions and local perceptions need to be taken into account.

Following this argumentative debate on the context conditions for development in the distinct Indian states, I will thus focus on a qualitative and narrative account of the socio-political and historic governance situation. This is supported by the assumption {Basu, 2002} that better governance quality leads to better development outcomes, i.e. provides more appropriate context conditions for introducing new approaches such as the CDM. Special attention will be paid to the perceived quality of governance, economic freedom, government performance and society-government relations in the four Indian states.

**Andhra Pradesh** hosts a stable state government {Court, 2001}. As an exception among most Indian states, another example being Tamil Nadu, right after Independence the public distribution system was extended and development expenditure expanded to rural areas {Pai, 2001}. However, state government

institutions and bureaucracies hold a tight reign on power and resources. This entails hostility to decentralisation, rejection of elected local officials and reluctance to involve civil society. Consequently, the pay-off of a dynamic but dominant state government is the exclusion of other societal actors. With Congress being the dominant party, only few incidences of intrastate violence are observed and relate to Maoist rebels in rural areas.

**Punjab** is described as an example of a state that has managed to balance repressions. Although it was previously characterised by political fragmentation and corruption, it has now achieved imposing firm order, however, on the account of concessions to various ethnic and linguistic identities {Mitra, 2006}. The dominant party is thus a state-based political institution.

**Tamil Nadu** is perceived as having established an own regional identity {Mitra, 2006}. However, supportive institutional arrangements required for bridging the regional identity with government institutions and procedures are still lacking. For this reason, a sense of anxiety and insecurity characterises the governance context and contributes to political fragmentation. The party predominant in Tamil Nadu is also a state-based political institution.

The state of **Maharashtra** is similarly characterised by deep identity roots {Mitra, 2006}. Traditional and modern institutions and practices are intermeshed. However, government institutions try to engage in political negotiation to mitigate social conflicts and confrontations between tradition and modernity. Another characteristic feature is the functional role cooperatives and private actors adopt in state politics as an attempt to reconcile antagonist positions. The Congress Party and the central Hindu Party play a dominant role. However, repeated incidences of intra-state violence talk of clashes between religious groups and a continued hostility towards foreign investors.

After this short historic and socio-political background brief, I will now discuss governance conditions drawing on objective census data related to poverty and growth statistics and relating to perceptions of corruption, economic freedom and policy management (Table 1).

Table 1: Context Conditions in Indian States

Context	Proxies	Andhra Pradesh	Punjab	Tamil Nadu	Maharashtra
<b>Social</b>	% population below poverty line <sup>1</sup>	15.77	6.16	21.12	25.02
<b>Economic</b>	% growth per capita GDP <sup>2</sup>	8.5	3.6	4.3	2.5
<b>Political</b>	Government stability – parties <sup>3</sup>	INC (national)	SAD (state)	DMK (state)	BJP (national)
<b>Policy Management</b>	Quality of Governance Index <sup>4</sup>	9	11	1	3
<b>Economic Management</b>	Economic Well-Being Index <sup>5</sup>	9	2	5	1
<b>Law &amp; Regulations</b>	Corruption <sup>6</sup>	4	7	12	5
<b>Human Rights</b>	Minorities, religion; violence	Intercaste violence		Intercaste violence	Restricted religious freedom

<sup>1</sup> Saxena (2001)

<sup>2</sup> Saxena (2001)

<sup>3</sup> Bhattacharyya (2005): INC (Indian National Congress); SAD (Shiromani Akali Dal); DMK (Dravida Munnetra Kazhagam); BJP (Bharatiya Janata Party)

<sup>4</sup> Basu (2004)

<sup>5</sup> Basu (2004) & Debroy (2005)

<sup>6</sup> Transparency International (2005)

<b>Participation</b>	Press freedom <sup>7</sup>	Some incidences	Past incidences	Hot spots of violation	Frequent incidences
<b>Facilitation</b>	CDM support <sup>8</sup>	Lead in CDM cell	Selected for CDM capacity building	Possibility for CDM cell	Possibility for CDM cell

Comparing objective census data and perceived government performance in these states, at first sight, hardly any significant differences emerge:

Poverty rates are relatively low particularly in Andhra Pradesh (15.77%) and Punjab (6.16%) while economic performance in terms of SDP per capita mirrors this picture with Andhra Pradesh (8.5%) being the best performer. With regard to perceived public sector performance taking water supply and energy as examples (Transparency International, 2005) all of these states have medium to high perceived performance levels. Furthermore, health and education indices reveal medium to high achievement rates with the exception of Andhra Pradesh as for education.

Whereas for objective governance statistics all of these states can be characterised as relatively similar, differences emerge looking at the perceived governance quality:

Maharashtra and to a limited extent Andhra Pradesh reveal favourable until mediocre scores on perceived economic well-being and quality of governance indices, which are in line with the perceivable low corruption, i.e. a sound legal and regulatory framework. Punjab is characterised by favourable economic governance and freedom conditions although overall governance quality and corruption are considered moderate. Tamil Nadu represents an outlier as despite good scores on the quality of governance and economic well-being, the regulatory and legal framework is perceived as corrupt.

For the sake of an evaluative assessment of the different context variables, the states are assigned different rankings based on indicators and data as well as on narrative accounts (Table 2):

Table 2: Impact Assessment of Context Conditions

State/Context	Andhra Pradesh	Punjab	Tamil Nadu	Maharashtra
<b>Social</b>	+	++	o	-
<b>Economic</b>	+++	+	++	+
<b>Political</b>	+	+	-	-
<b>Policy Management</b>	+	o	++	+
<b>Economic Management</b>	o	++	+	++
<b>Law &amp; Regulations</b>	+	o	-	+
<b>Human Rights</b>	-	+	--	--
<b>Participation</b>	+	++	-	--
<b>Facilitation</b>	+++	++	+	+

Ranking: +++ (very favourable); ++ (favourable); + (relatively favourable); o (Indifferent); - (relatively less favourable); -- (less favourable); --- (least favourable)

With regard to the picture presented above, formulating hypotheses on the relation between context factors and the set up of new approaches to energy supply through the CDM appears quite complex. Objective census data on the social, political and economic conditions taken together with democratic factors such as human rights and participation allow for arguing that Andhra Pradesh and Punjab might display a slightly more favourable and stable overall context. This is partly contradicted by the perception indicators on governance quality and economic well-being. Hence these perception-based assessments give rise to the counter hypothesis that Maharashtra and to some extent Tamil Nadu provide comparatively slightly better context conditions for CDM investment.

A word of caution at this stage needs to be made that firstly, composite and perception-based indicators are prone to distortions and that secondly variations between the states, especially Maharashtra and Andhra Pradesh, are marginal.

<sup>7</sup> Mushky (2005)

<sup>8</sup> TERI (2005)

How do these contextual features go together with the geographical distribution of CDM projects? What context conditions play a more significant role? Are there other variables not yet fully considered that ultimately influence the outcome?

In summary, the distribution of CDM projects concentrates on the states of Andhra Pradesh and Punjab (Fig. VI). In contrast, Tamil Nadu and Maharashtra are among the three states receiving the least of CDM project investment.

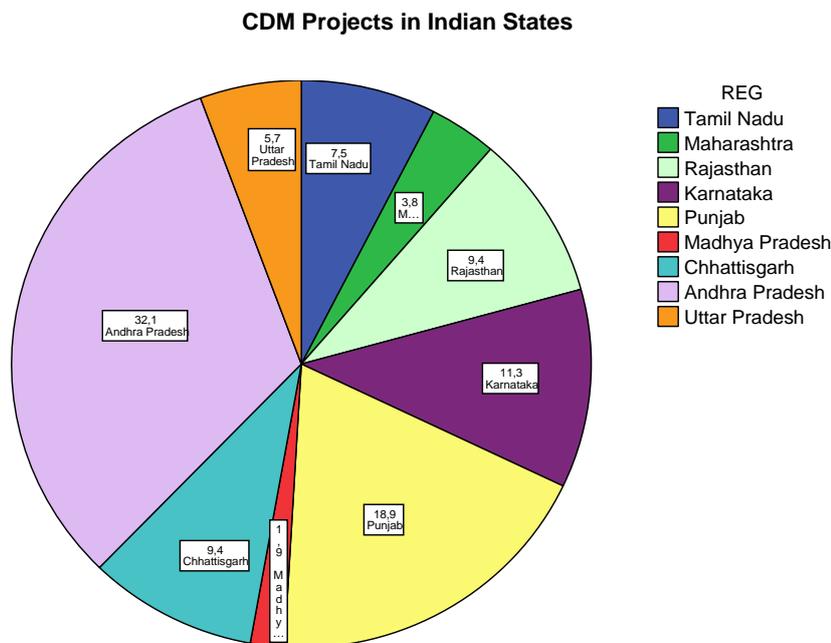


Figure VI: CDM project distribution India

Explaining this geographical distribution, reference will now be made to the contextual conditions discussed in the sections above:

With regard to the factors describing the social, economic and political context, the concentration of CDM projects in Andhra Pradesh and Punjab is explained by an overall favourable socio-economic framework. Furthermore, features of corruption and good governance in terms of human rights and participation allow for the conclusion that relatively moderate and stable conditions provide a comparative advantage for the set-up of new approaches to rural energy supply.

Considering perception indicators for governance quality and economic freedom, the actual CDM distribution at first sight appears surprising since especially Maharashtra and also Tamil Nadu receive better rankings. However, turning towards the political and social context and history, comparative disadvantages emerge. Political frameworks conditions are characterised by a relative instability as Maharashtra is dominated by the nationalist Hindu party and experiences frequent incidences of press freedom violations, restricted civil liberties and religious freedom, and lacking ethnic and religious representation. As for Tamil Nadu, an ethnically dominated state party holds the power, and repetitive intercaste clashes render the state a hot spot of violations of civil and press freedom.

In conclusion, the findings presented and discussed above suggest that socio-economic context conditions as well as the historic socio-political framework are relevant for explaining the concentration of CDM investment in the selected Indian states.

## CONCLUSIONS

In the context of this article, I have examined the explanatory significance of context conditions for the establishment of CDM projects in Indian states. The background to this puzzle evolves from the dismal state of rural electrification in many Indian states and the failure of previous attempts to provide rural energy supply particularly to the rural poor.

In this context, the CDM as a new project-based mechanism in the light of the international climate regime appears as potentially new approach to rural energy supply. For this purpose, different governance context factors were examined in relation to the geographical distribution of CDM projects in selected Indian states.

In summary, the most significant finding of the analyses confirms the assumption that contextual factors specifically related to political stability, good governance in terms of human rights, participation and regulatory framework, and socio-historic conditions correlate with the distribution of CDM projects. This leads to the conclusion that certain context conditions regarding the socio-political framework indeed matter for the successful implementation of new renewable energy options.

However, at this place some caveats have to be mentioned:

Firstly, attention needs to be paid to the fact that the findings are not without contradiction since the perception-based indicators on governance quality and economic freedom slant the analytical conclusions.

Secondly, at this stage it has not been possible to weight between the different context factors since expert interviews and local surveys would be required for further assessments. Thus, distinct success factors characteristic of a favourable governance context cannot be elicited.

Thirdly, the fact that only states already benefiting to some extent from CDM investment were chosen as case studies needs to be mentioned as this implies potential biases.

Finally, the context factors selected for examination are adopted from democracy and good governance literature. However, in order to allow for a more complete and holistic assessment a suggestion for future research is to include other theory-based assumptions and variables. This refers to specific sectoral policies and institutions, i.e. in the field of energy policies and rural development, which presumably matter since many CDM projects are on-grid applications.

Furthermore, government and international donor support creating a facilitative institutional and policy framework for CDM activities presumably constitutes a significant intervening variable. This is already supported by the fact that Andhra Pradesh with the greatest number of CDM projects was among the first three states receiving capacity building and an independent CDM cell whereas for Maharashtra with the least amount of projects such options are still under investigation.

In conclusion, local socio-political and historic framework factors matter for the establishment of new approaches such as the CDM and hence amount amongst other elements to determinative success factors for rural electrification through renewable energy options.

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