Summary

Over a decade of international climate change negotiations has led to the introduction of climate change instruments (CCIs) that offer incentives for undertaking activities climate-relevant and facilitating sustainable development at global and national levels. The question is whether these instruments will have any impact on the small scale industries (SSIs) which are significant contributors to both socio-economic growth and greenhouse gas (GHG) emissions in developing countries. Given the spread of SSI activities in the developing countries, leaving them out would lead to not addressing an important segment of the climate change problem. It is in this regard that this thesis examines the link between the CCIs and the SSIs. Beginning with the proposition that the CCIs will not focus on SSIs, unless appropriate measures are applied; the thesis has examined the role of CCIs in shaping SSI–environment interaction.

The main objective is: To determine whether the climate change instruments can facilitate the diffusion of cleaner technologies in the small-scale industries in developing countries leading to sustainable development benefits, by examining the synergies and conflicts between these instruments and national policies in India.

The central research question is: Under what circumstances can climate change instruments induce the small-scale industries sectors in developing countries to contribute towards the global efforts for addressing climate change and at the same time assist the process of sustainable development at the national level?

In order to address the central research question, the thesis uses theoretical perspectives related to: (a) ecological economics for assessing the climate change policies and instruments for diffusion of cleaner technologies at various levels, and (b) evolutionary theory of technological change for providing insights into the complexity of factors influencing cleaner technology diffusion in the SSIs. Thereby, the macro approach (with a focus on policy implications) is reinforced by the feedback from conditions and actions of actors at the micro level, and visa versa. The co-evolution of the two approaches provide a better understanding of the issues in each in order to acquire insights regarding their linkages (especially in terms of how micro level can respond to macro level policies, and in turn how these policies may be built to have the desired impact on the micro level).

The research framework has been developed to assist in analysing the role the international policy instruments may play in shaping SSI–environment interactions by focusing on the interplay between the policy implications and the contextual factors. The methodology used is largely qualitative, including literature survey, primary interviews and multiple case studies (involving primary survey and interviews). The central research question is sub-divided into more focused research questions.
Research question 1: How do climate change instruments create incentives for diffusion of cleaner technologies in the small-scale sector in developing countries? How do the national policies address climate change in India? What are the policy implications of climate change policies and policy instruments for the small-scale industries in India?

Research question 2: Which national policies address the small-scale industrial sector in India? What are the implications of the national policies for the diffusion of cleaner technologies in the small-scale industries in India?

Research question 3: What are the main drivers and barriers related to diffusion of cleaner technologies in the small-scale industries in India?

Research question 4: How can small-scale industries benefit from climate change instruments and contribute towards a reduction in greenhouse gas emissions? How can climate change instruments affect small-scale industries–environment interactions?

Research question 5: What lessons can be drawn from the Indian small-scale industries sector for the design and implementation of policy instruments under the international climate change negotiations?

The analysis of the institutional framework at international level focuses on the instruments developed in the climate change regime. The CCIs on the one hand promote public awareness of climate change issues and, on the other hand, provide additional opportunities for finance, technology and/or capacity-building for addressing climate change (although focus has largely been on financing). India, with a significant GHG mitigation potential, is a key host for these climate relevant and sustainable development initiatives. While the climate change policy incentives are significant, they are also associated with uncertainties, transactions costs and market biases. These issues are especially relevant for small-size and low-capital SSIs. SSIs are low on the priority list in international and national climate change policies. The situation is slowly evolving and there are indications of the diversification of CCI portfolios with SSI projects being considered under GEF and CDM in India. However, these are still only a few and are mainly for capacity-building. It thus appears that the top-down approaches though relevant will remain constrained unless the associated issues are resolved or addressed.

A follow-up analysis of national SSI policies in India reveals that although these have been motivated by social and equity concerns, energy efficiency considerations have played a minor role and there has been little integration between the diverse policies focusing on this sector. Until the late 1980s, the SSIs were protected; but this inadvertently implied that the sector also stagnated. Following the Bhopal gas tragedy, environmental reform was prioritised, but progress has been slow. Community pressure and public interest litigation (PIL) combined with a proactive judiciary have promoted the opportunities for enforcing environmental policies. In the current scenario, two challenges emerge as especially relevant for the SSIs; one, with processes of liberalization and globalization, the SSIs face the threat of increased competition,
both from within and outside the country, and two, the regulations addressing at least local pollution and their enforcement are projected to become stringent. In addition, the increasing concerns for the global environment and relevant international policies are likely to have direct or indirect implications for the SSIs. The SSIs, therefore, will have to improve their processes and adopt cleaner technologies to be more competitive. A transition of the SSI sector towards more sustainable developmental paths is needed. Given the large number of these industries, and other national concerns, government support available for technology upgrading in SSIs will be limited. Hence, innovative strategies for the diffusion of cleaner technologies are required if the SSIs are to survive and grow in a sustainable manner.

The research focuses on three SSIs clusters in India, where national environmental policies have brought about a change in terms of cleaner technology diffusion, and in that sense, have been “diffusion forcing”. This not only helps to draw lessons for drafting international environmental policies, but also to examine the barriers and drivers that exist that may influence these policies (and thereby also address RQ 3).

The case study of the iron foundry cluster in Howrah shows that compliance with the specified emission standard in the cluster with a niche market for low-grade castings was limited, until the intervention of the Supreme Court. A judicial order issued by the Court increased enforcement measures by local authorities, leading to almost all units installing the required pollution control devices (PCDs) in order to comply with the standard. It however did not lead to sustained enforcement. Many PCDs are inefficient, are not properly maintained, and operate only during inspections. The regulatory instrument was supplemented with a partial subsidy for PCDs. This led to a joint initiative between a local industry association, a technical institute and a financial institution for technology improvements in select small units.

The case study of the glass cluster in Firozabad reveals that fuel switching in this large cluster was triggered following the Supreme Court’s order to ban use of coal and recommending a shift to natural gas in the Taj Trapezium Zone (TTZ), in response to a Public Interest Litigation (PIL) for protection of the Taj Mahal. Stringent enforcement measures by local authorities forced many glass units to switch to natural gas furnaces. Subsequently, however, financial benefits of natural gas led to more units opting for the switch. The larger units with access to natural gas have started subletting their space and infrastructure to units without natural gas access. However, coal is still being used in the cluster. Technical support was also provided by setting up a technical institute specifically for the industry; however, with little interaction with entrepreneurs it has not really met the needs of the cluster and among local industries is called a white elephant.

The third case study of the brick cluster in Chandigarh shows that technology forcing was encouraged through an emission standard, which included a ban on the conventionally used technology. The enforcement of the standard was pushed following a Supreme Court’s response to the PIL highlighting the adverse impacts of coal use in the SSI. However, compliance by the cluster was achieved largely because technical institutions provided the alternative technology as a consultancy package. This tech-
nology was approved by the local authorities and helped SSIs in getting the required licenses. It could not however improve operational practices in the units despite increasing the awareness and technical levels of the entrepreneurs.

A comparative analysis of the case studies shows that there has been very little technological change in the SSIs over a long period of time. One of the reasons has been the perverse incentive created by the national policy characterized by regulatory instruments focusing on end-of-pipe solutions and a protective approach due to social and political motivations. The other has been the SSIs’ own limited technological capabilities (production, innovative and investment capabilities) coupled with social (attitudes and culture) and techno-economic (including lack of market demand and access to technology and finances) deterrents. It is the interplay of contextual factors that impact the effectiveness of policies at the local level and shape the technological paradigm for SSIs. Initiatives to change the status quo have been successful only in some cases where the push has come from external sources; more often the piecemeal approaches benefit only a select few. A transition to a new and sustainable paradigm therefore requires an integrated approach, under which increased regulatory push, effective capacity building, adequate financial and technological support, possible market incentives and networking are facilitated.

Theory lists various pathways or levers for change, including private (SSI-unit level), community (networks, associations) and policy-driven initiatives. Owing to the prevailing contextual factors, it is difficult to envisage that the SSIs themselves would undertake concerted efforts for cleaner technology diffusion. Though networks and associations have proactively or collaboratively brought a change in some cases, they usually do not really focus on cleaner technologies diffusion. The national policy provides but limited incentives for cleaner technologies. In addition, the CCIs provide incentives for cleaner technologies by offering opportunities for capacity building and increased access to additional funding, technologies and market avenues. Mapping SSI needs with the CCI objectives indicates that, in principle, the CCIs can assist in the transition as can the national policies. The question is: Can CCIs help the SSIs, and whether SSIs can make use of the CCIs and in turn contribute to GHG reduction efforts?

In principle, the CCIs along with national policies can assist the SSIs in India. CCIs could facilitate targeted capacity-building activities, address the issue of putting a premium on cleaner products and processes, support programmes for improving basic infrastructure and access to cleaner fuels, and also assist in developing the existing initiatives for cleaner technologies diffusion in SSIs further. SSIs fare strongly on account of their national and local sustainability benefits, as well as on additionality, wherein the SSIs constitute a sector where there is inactivity on its own in terms of pollution control and climate change, and needs an external impetus. The development of SSIs is of national priority, especially because they will continue to provide economic and livelihood opportunities to India’s significant proportions of population. Even though the GHG contribution of the SSIs is not as prominent as the large-scale industries, their large numbers and degree of energy inefficiency are a matter of
concern from environmental and developmental perspectives (the energy-saving potential in case study SSIs was found to be more than 50 per cent). Diffusion of select cleaner technologies ranging of options from simple modification in operating practices to modern technologies can bring down energy consumption and thereby GHG emissions from the sector, along with other economic (increase competitiveness), environmental (reduce pollution) and social benefits (better working conditions), and also help meet the environmental norms.

However, there are some counterarguments as well. At present, there are only a few cases of SSI-relevant activities undertaken. These are mainly geared towards capacity building rather than actual implementation of cleaner technologies in the SSI units. In international and national debates and discussions related to climate change, there is representation from the Indian industry, but within that the SSIs are practically absent. At the local SSI level there is low environmental consciousness and a set of contextual barriers. At the national level, the SSIs are low in priority within the national environmental and climate change policies. In terms of CCIs, at the national and international levels, the incentives are weak for SSIs due to uncertainties, transactions costs and market biases. Based on these, the research concludes that the CCI–SSI link clearly exists; however, in the present paradigm this is a ‘weak link’. The ‘CCI-signals’ regarding incentives offered somehow do not reach the local levels and the potential of CCIs is restricted to the higher levels due to a lack of corresponding policies and instruments.

It has been suggested that the existing ‘weak link’ can be strengthened by adequate policy responses to: (a) strengthen the incentives provided by the climate change policies and policy instruments, (b) work on the contextual factors by addressing the barriers and reinforcing the drivers, and (c) strengthen the synergies between policies at international and national, including state, industry, local levels. At the national level, the international policy instruments may be translated into national instruments, and programmes built to reflect global environmental objectives as well. At the international levels, the national policy objectives may be integrated into the broader climate goals, and instruments may be used to also support ongoing programmes and organization related to activities in the SSI sector that lend themselves to the global GHG reduction efforts. Possible policy responses as put forth in this thesis include four propositions:

- **Effective capacity building** and increasing the **knowledge base** of SSIs and various stakeholders, and facilitating interaction between them. SSI representation may be encouraged in the different climate change fora for overall policy making and implementation related to cleaner technologies in the country.

- Strengthen policy incentives – in particular, highlight **sustainability** and ‘**additionality**’ of SSIs projects. This may be done by a ‘host-driven’ emphasis or providing a ‘**sustainable development premium**’ on projects and products with clear additionality and high sustainable development benefits.
• Lower **policy uncertainties**, including those related to the international regime, national climate change policies and CCI modalities. This may be done by setting agencies for developing SSI projects; helping in host–investor negotiations; and introducing innovative methods like a tax for approving CCI projects which may be used for SSI promotion, providing a sectoral emphasis and a national carbon fund with focus on sectoral or cluster-level baselines for SSI projects.

• **Reduce transactions costs** at each level for SSIs and bringing in greater transparency in the process. This may be done by setting up a separate CCI for SSIs, or a sub-set of the existing CCIs with lower transactions costs and streamlined procedures. Targeting the collective efficiency of SSI clusters may also reduce transactions costs. Schemes could be developed to build on existing networks and associations, and also develop new partnerships by strengthening nodal agencies.

While these provide the necessary conditions, they may not be sufficient in bringing in sustainability in the sector via GHG-reducing CCI activities. In the case of climate change, as the options to address the problem are embedded in specific human activities, their interaction with the national and local-level institutions and policies is critical for their intentions to be transmitted at these levels and vice versa. It is also critical in assessing that they have been meeting the environmental objectives and do not get limited as tools for political and economic ends. This research is only one such analysis, as an attempt to understanding the macro-micro linkages in a theoretical as well as practical context. It takes a broader approach than what is offered by, but inclusive of, the standard environmental theory in order to provide a holistic assessment of the linkages between international institutions and local actions.