CHAPTER VII

CONCLUSION – AN EMERGING REGIONAL MODERNITY

7.1 Is current bioenergy practice sustainable?

This research concludes that bioenergy development in Thailand has the potential to contribute to sustainable development and a shift towards more efficient use of agricultural biomass. However, there are several constraints from a regional perspective. Increasing demand for agricultural feedstocks is placing an unsustainable burden on the natural resource base in the Mekong region. Lack of sufficient political will to coordinate trade and investment policies, particularly in the agricultural sector, continues to be a significant impediment to sustainable resource management. Nevertheless, the political panorama may be forced to reform with the likelihood of increasing scarcity of water and land, as Thailand's neighbours open up for the first time to the global economy.

Three main objectives were addressed during the course of the research. The first objective was to examine Thailand's policies concerning trade, environment and sustainable development through a case study of bioenergy. The policy framework for bioenergy in Thailand was analysed in Chapter IV in support of the main hypothesis that trade in bioenergy in the Mekong region is likely to increase.

Second, the implications of these bioenergy policies on sustainable development in Thailand and the Mekong region were explored in Chapter V through case narratives. The claim was put forward that an increase in Thailand's trade in biofuels in the Mekong region is likely to have a negative impact on sustainable development. The conclusion flowing from the field evidence to inform this claim is mixed. The case is cautious in several respects, but generally strong and positive for the development of biofuels in Thailand as supported by the data collected during this research. This is not necessarily the case for the Mekong region if the current policy framework remains.

On the one hand, the case narratives illustrate the initial hypothesis that, based on the current policy framework, increased trade in bioenergy is likely to have negative implications for sustainable development in the Mekong region. On the other hand, the outcome could be

beneficial if the *Business As Usual* scenario shifts more to the *Small is Smart* scenario and away from the *Great Gamble* as outlined in the previous chapter. As the research in this thesis suggests, there are bright spots in Thailand that illustrate *Small is Smart*, where smallholder agroenergy is contributing to improving livelihoods and farming practices. However, there is insufficient regional coordination of these efforts to bring about a tipping point in renewable energy use or sustainable resource management.

The third objective of the research was to identify Thailand's policy options to provide alternative scenarios towards a regional interpretation of modernity in the Mekong. The aim was to better integrate social and environment policies at the local, national and regional levels in order to achieve sustainable bioenergy development. The purpose of devising an alternative set of policy priorities is to promote sustainable development for all parties in the Mekong to reap the gains of a shift to alternative energy sources, such as agroenergy. The first-best policy option was outlined in the *Small is Smart* scenario in Chapter VI. This scenario is illustrated by the case narratives in Rangsit, Aoluk, and Vanghinlad.

The final objective advances a variation of the initial conceptual framework of *multiple modernities*. The evidence suggested by the case narratives supports the need for a *regional* articulation of agroenergy development to address the socio-ecological consequences. The analysis in the previous chapter builds the case for *regional modernities*, extrapolating on Sivaramakrishnan and Agrawal's (2003) definition to include ecological connectivity in the spirit of Arturo Escobar's (2008) 'territories of difference.'

The degree of reflexivity characteristic of modernity allows for the possiblity of different interpretations of development. As noted by S. N. Eisenstadt, a leading figure in modernisation studies (1966, 1970, 2000): "It gave rise to an awareness of the possibility of multiple visions that could, in fact, be contested." Moreover, interpreting different dimensions of modernity establishes an *ecological* limit to the project of modernity. As highlighted by Arturo Escobar (1995), "there are no grand alternatives that can be applied to all places or situations." There is no grand narrative of historical progress (Lyotard 1984). The alternatives are to be found "not in academic circles – critical or conventional – or in the offices of institutions such as the World Bank, but in a new reading of popular practices and of the re-appropriation by popular actors of the space of hegemonic socio-cultural production (Escobar 1995).

The case narratives draw from "popular practices" to support the argument for increasing regional integration as a basis to embed local bioenergy initiatives in a more sustainable and integrated agricultural landscape. Despite the policy frameworks in ACMECS and ASEAN, regional governance of the agricultural sector – land, water, trade and investment policies – is fundamentally *lacking in practice* in the Mekong. Therefore, the alternative policy approach in the *Small is Smart* option is put forward according to the theory of regional modernities in order to better integrate trade, environment and sustainable development. This scenario supports the regional integration of small-scale farmers into a broader framework for agroenergy production and use. It envisages smallholders as spearheading sustainable resource management and tackling energy poverty.

The hypothesis for this research posited that the prospects for Thailand's trade in bioenergy in the Mekong region are favourable. First, the research supports the conclusion that Thailand's trade in biofuels is likely to increase. Based on an assessment of the current state of play in Chapter IV, Thailand is likely to increase exports of ethanol. The main driver of this expansion is Thailand's requirement for blending ethanol and biodiesel in the commercial fuel mix in the transportation sector and increased incentives for feed-in to the electricity sector. There is likely to be more imports of agroenergy feedstocks to meet the blending targets for ethanol. In addition, more imports of palm oil will likely be needed to meet the blending requirements for biodiesel, given the lack of sufficient domestic supply of crude palm oil. While domestic consumption at present primarily feeds into the domestic supply of ethanol, trade in the region is likely to grow in ethanol. Moreover, this trade is likely to increase with the commercialisation of second generation biofuels.

Second, based on the current policy framework, the initial hypothesis was put forward that increased trade in bioenergy is likely to have negative implications for sustainable development in Thailand and the Mekong region. The research supports this conclusion as a general point. Nevertheless, a distinction should be made between small-scale bioenergy initiatives (to some extent for tapioca based ethanol but predominantly for biodiesel) and commercialised production of biofuels (mainly for sugarcane (molasses)-based ethanol).

To the extent that an expansion of agroenergy crops displaces forests or biodiversity, the negative consequences of Thailand's current policies are likely to impact more significantly in neighbouring countries for two reasons. First, Thailand's land frontier is

considered to have closed in the 1980s – there are simply few forests left to destroy. In the rest of the Mekong, however, the land being opened for agriculture is increasing and domestic and foreign investment in that land has increased significantly. Second, as a direct result, Thailand and others foreign investors are extending their natural resource grasp into neighbouring Mekong countries, thereby externalising the socio-ecological costs of modernisation. These costs in the agroenergy context are being borne for example by Lao PDR, Cambodia, Myanmar and Vietnam. The proliferation of large-scale land concessions for agricultural commodities in the interests of Chinese, Thai, Vietnamese and Korean investors is increasingly cause for concern.

Moreover, Thai agroenergy investment in Cambodia, Lao PDR and Myanmar, in combination with the plans to increase transportation links in the Mekong region, is already resulting in a shift in production patterns and agricultural land and water use intensity. While creating some opportunities for the local economies in neighbouring countries, this research suggests that the current model of Thai agroenergy investment is serving to export the socio-ecological costs of production.

Finally, flowing from the preceding hypotheses, the purpose of this research was to gain a better understanding of current policies and practices in order to put forward an alternative set of policy options. The policy recommendations developed above attempt to promote sustainable development for all parties in the Mekong region to address the negative consequences of the expansion of bioenergy, whilst capturing the benefits of a shift to alternative agroenergy sources.

In this respect, four aspects are highlighted from the interviews, focus group discussions and case narratives. First, the shift to cultivating agroenergy crops is already underway in Thailand and the Mekong region. The significant growth in agroenergy crops is illustrated in Chapter V in Thailand (cases 1 to 4), Champassak, Lao PDR (case 5) and Shan state, Myanmar (case 6).

Second, assessment of the sustainability of this shift is growing and urgently required. Without a comprehensive and realistic analysis of the impacts on land and water availability and use for the agricultural sector in general – not only for agroenergy crops, the Mekong region may face serious social unrest and environmental consequences in the period ahead. This research indicates that sustainability must be embedded in the policy choices concerning

agricultural development in general, including for agroenergy crops. This is the message emanating from the field interviews and focus group discussions undertaken for this research.

Third, these developments are transpiring in the context of multilateral attempts to discipline the agricultural sector in the World Trade Organisation. Critics point to the fact that the WTO has yet to make sufficient progress in securing market access for developing countries. Nevertheless, the current disciplines governing agriculture will be constrained by technical and phytosanitary barriers. These non-tariff barriers are likely to be extended to cover the carbon footprint of traded products, further necessitating attention to the way in which products are produced, not only the characteristic of the traded products themselves. That is why the energy efficiency gains from better use of agricultural residues are important to bring about greater sustainability both at the local level in Vanghinlad Tampon (case 2) and Aoluk, Krabi (case 3), as well as the industrial level in Khon Kaen (case 4).

Fourth, the groundwork has been laid to enable greater integration at the Mekong regional level, with the potential to engage local level stakeholders and private sector actors. The portfolio of policy options outlined in the previous chapter reflects the need to engage the policy making process to counter this trend at all levels – local, national, regional and multilateral to manage the natural resource base more sustainably and equitably. This is an argument for regulation, quality control and enforcement, while simultaneously tackling lack of transparency and endemic corruption. This is why this research argues for a mechanism for policy making to assess the overall regional landscape for agroenergy taking into account the agro-ecological zones. Targetting policies to address ecological sustainability of these zones are the underlying basis for further prosperity in the Mekong.

To date, growth and development have been solely conceived of in terms of gross domestic product. However, strategies to sustainably develop land and natural resource use in the Mekong need to go beyond this classical measurement of growth, it is argued in this research, to encompass the many aspects of the overall agroenergy picture. From this perspective, the economic crisis has encouraged governments in the Mekong to find ways to improve resilience and decrease vulnerability in the agricultural sector. Thailand's leadership is needed to guide the Mekong region through the maze of development hurdles.

7.2 Revisiting the theory of multiple modernities: context matters with caveats

A new development paradigm centered on the ecological quality of economic growth should be urgently explored by Asian leaders to minimise the damages from climate change.

Han Seungsoo, UN Special Envoy for Climate Change, 2007

Modernity today is global and multiple.
It no longer has a Western governing center to accompany it.

Dilip Gaonkar, Director, Center for Global Culture & Community, Northwestern University

How best to see the world anew and escape from old ideas? According to development economist and Nobel laureate Amartya Sen, capabilities for development are context dependent in this era of globalisation. In other words, there are various paths to define modernity based on the domestic context in a particular country. To be effective, countries require sufficient flexibility to put in place policies to achieve sustainable development that are an expression of their individual or regional construction of modernity. This flexibility recognises the reality as quoted above from Dilip Gaonkar that modernity is no longer a solely Western-centric construct – it is globally and multiply constituted.

There is a need to revise the theoretical basis for this thesis to provide a regional component to the theory of multiple modernities. A paradigm shift is required that recognises the tendency for regional narratives to develop based on common agro-climactic zones, natural resource connectivity and biodiversity corridors; to have common resource frontiers that are not necessarily defined within the borders of one nation state. That is the case in the Mekong region.

The main lines of argumentation are to provide a theory that reworks modernity or interprets the process of modernisation based on the notion of ecological systems, environmental limits and natural resource frontiers. The policy implication assumes a high degree of coordination in order to allow for the *Small is Smart* scenario to increase the public good nature of agroenergy decision making. It needs to be emphasised that such a level of coordination has yet to be witnessed in the Mekong for various historical reasons. Yet, it may well be that a worsening socio-ecological situation will necessitate regional coordination (for example the drought in 2010 resulting in low water levels in the Mekong).

There is thus a need for increasing policy space for regional actors to act jointly to design a framework to protect public goods and environmental services (such as the water in

the Mekong) in concert with local level actors. In this manner, the development process is better understood through an examination of local narratives and their flexibility to implement sustainable development in practice in the field. This revised theory, thus, links the global and the local through resource management narratives that are not necessarily contained within the confines of a single national border, but which straddle a region and require regional policy space to preserve socio-ecological sustainability.

The concept of *regional modernities* defines a path to modernisation based on geographical considerations linking communities within regions according to the continuity of biodiversity and natural resources in linked localities defined loosely as a region. Sivaramakrishnan and Agrawal (2004:20) define this concept in terms of local cultures, social and institutional structures and environments "that mediate power and shape the consequences of globalisation." They use the term as a flexible "organising concept to explore the contested histories of development and the shifting links between ideas about development in different locations" (2004:24).

It follows that this annunciation of an appropriate path of modernisation, in turn, is linked inextricably to the natural resource and ecological base not necessarily only in an individual country, but in ecological regions that may encompass several countries. From an ecological and biodiversity perspective, the Mekong region is more than the sum of its parts. In this light, the conceptual framework for this research needs to be adapted from the more general reference to *multiple* modernities to emphasise the potential contribution of *regional* modernities to sustainable development.

This research contributes select case narratives towards informing a Mekong strategy for a regional energy transformation. Clearly, Thailand has the building blocks in place at the local level and the institutional mosaic to orchestrate an energy revolution. What is needed all the interviewees agree is the political will to stay the course and the vision to see it in Thailand's broader interest to extend the local community model to the region.

There is evidence of the potential benefits of small-scale agroenergy expansion at the local level in Thailand. However, there is also evidence of the risks of unsustainable modes of Thai agroenergy investment in neighbouring Mekong countries. That is why the framework for this thesis has been revised from the initial formulation at the outset. The revision is made

to emphasise the importance of developing a regional modernity that incorporates and gives importance to small-scale agroenergy at the local level.

Despite the strong political commitment to commercialising ethanol and biodiesel in Thailand since 2003, the economics of supporting biofuels and other forms of alternative energy is likely to entail an initial financial commitment. This is likely to be the case given the uncertain and fluctuating price of fossil fuels. In this respect, it bears emphasising, therefore, that these evolving narratives need not repeat mistakes learned in other countries. Nor need they ignore conventional wisdom concerning subsidies. While Brazil's ethanol sector today is subsidy free, subsidies were an integral component of the viability of agroenergy initially.

This leaves us with a fundamental question underlying the hypothesis of this research related to the *policy space* for countries to determine policies to advance sustainability. Is Thailand positioned to reap the potential benefits of developing a viable biofuels sector following the example of Brazil? Or, will Thailand repeat the mistakes of those countries that have put in place burdensome subsidies and allowed for agro-industrial production to crowd out smallholder agricultural production?

Based on the evidence gained from the field visits and the insights shared by the full range of experts in the region, it is the central contention of this research that Thailand must persevere to maintain its policy space to promote alternative energy sources, including biofuels. There are three caveats to this conclusion to optimise the socio-ecological sustainability of the outcomes. First, Thailand should rationalise the current conflicts in domestic policies and regulations (e.g., to export ethanol and import palm oil). Second, there is a need to adjust policies to meet renewable energy targets based on the feedback from the local level gained during implementation (e.g., to expand oil palm cultivation in the north and northeast). Third, Thailand should take the lead to strengthen the regional framework for trade and investment in the agroenergy sector, encompassing energy and food security (e.g., to transfer to the Mekong region best practice as evidenced in small-scale agroenergy integration in Thailand).

As set out in previous chapters, there is a multiplicity of sufficiently rigorous explanations to justify the promotion of biofuels in rural Thailand. While it is necessary to improve the economics and monitor environmental sustainability, the argument of biofuels

proponents in Thailand and other developing countries is that the basket of benefits outweighs the constraints – at least in the transition period to a low-carbon economy.

The global-local nexus: seeking common ground at the regional level

If past practices are overwhelmingly deemed to be unsustainable, a sustainable pathway forward is less clear cut. There is, however, great promise emerging from a refocus on the agricultural sector and from rebalancing small-scale, bottom-up approaches to development. This is the lesson emerging from the case narratives elaborated in Chapter V of this research.

Field research for this thesis in central, northeastern and southern Thailand has illuminated a wealth of opportunities in those areas for small holder palm oil and cassava. The narratives include farmers moving from heavily fertilised and irrigated fruit orchards in Rangsit to oil palm; a community cooperative in Aoluk, Krabi being able to improve local incomes through oil palm. Smallholder cassava farmers using local oil nuts to fuel water pumps and small-scale machinery. These narratives illustrate that the bioenergy debate could benefit from more nuance when it comes to offering realistic opportunities to developing countries to tackle agricultural development, energy poverty and natural resource management.

With this objective in mind, developing countries need support from the international policy community to maintain their policy space to rise out of poverty in a discourse that by default is ignoring the historical responsibility for greenhouse gas emissions. That is to say, developing countries will face the brunt of climate change even though they have contributed the least. Moreover, the agricultural sector is of prime importance to generate incomes in the Mekong, while suffering from the most trade discrimination in the global market place. This is why the renewed focus on the agricultural sector is so vital to socio-ecological sustainability.

This thesis argues that global responses are not working and local solutions are insufficient to bring about a paradigm transformation to sustainability. From this perspective, *regional* alternatives are emerging as a potential way to bridge the policy gap between sustainable development policy and practice.

Local narratives need to take heed of the lessons learned on agroenergy. These lessons have been clearly annunciated since the 2008 food-fuel crisis and need to be reflected in national and regional debates on the direction of agro-industry and trade. There has yet to be a sufficient national debate on agroenergy in Thailand and certainly not in neighbouring countries. Moreover, the interviewees indicated uncertainty about agroenergy linked with policy coordination amongst the diverse ministries and levels that inform the decision making process. This is one of the reasons why the majority (57.3%) of respondents to the survey questionnaire conducted for this research considered that their country's bioenergy policy is not heading in the right direction and that there was a lack of sustained political leadership.

7.3 Recommendations for bioenergy in the Mekong

In a context where *political uncertainty* is among the main risks for the Thai economy, divisive politics may make it difficult for the Government to deal with the socio-environmental issues raised by this research. This research has tried to illustrate the opportunities to stimulate the benefits and mitigate the negative consequences of Thailand's shift to diversify its energy mix through more efficient use of agroenergy – to "get ahead of the curve" within the current capacity of the region. However, it is not sustainable to do this at the expense of the neighbouring countries natural resource base and local livelihoods.

While it would not be possible to replicate the entire Brazilian experience with biofuels, it is possible to extrapolate at least three policy recommendations for Thailand in the production, use and trade in bioenergy. First, focus on meeting the national blending targets established in the Alternative Energy Development Plan. Second, involve public-private partnerships to strengthen a strategic policy framework in which to develop both community and commercial biofuel production and use. Third, provide a coordinated regional approach to investment in agroenergy in order to create an operational framework for the development of the sector and to tackle energy poverty.

Results of this research demonstrate the following policy considerations for bioenergy development in Thailand and the Mekong region.

- Governance is a vital element in addressing the socio-ecological implications of bioenergy development. Insufficient national coordination is exacerbated by a lack of political will to take the difficult decisions once the technical evidence has been

accumulated. The bioenergy sector exemplifies the difficulty in factoring in a broad range of considerations on which to base policy decisions and in coordinating the work of diverse ministries. Among the main lessons is that bioenergy policy makers and practitioners cannot afford to work in separate worlds, despite the complexities of the issues. At present, there exists a rupture in perceptions of what needs to be done between different levels of the policy making process and local level practitioners.

- Empirical evidence indicates the efficiency gains from better use of agricultural residues in the production process at the community and commercial levels. This provides a starting point to stimulate a shift to a low-carbon economy in the Mekong region.

- Bioenergy development is based on the availability and price of agricultural feedstocks (cassava, sugarcane and palm oil). Developing this sector is, thus, integrally linked with implementing sustainable agricultural policies, such as providing incentives for integrated pest management and eliminating subsidies for chemical inputs. Thailand would benefit from diversifying the agricultural sector to shift from traditional, less profitable crops to those which can add greater value to the chain of production.

- Small-scale community biodiesel production and use has the potential to empower small landowners with energy sufficiency, thereby lowering their energy input costs and increasing incomes by adding value to agricultural production. This is the model Thailand should use to promote bioenergy investment in Thailand and the Mekong. To date, however, Thai bioenergy investment in the region has tended to outsource socio-ecological degradation to neighbouring countries.

- Whether Thailand develops the domestic and export potential for bioenergy will depend, to a great extent, on the private sector. Nevertheless, the success of private sector initiatives in capturing these emerging opportunities, in turn, depends on the institutional and regulatory setting. A secure investment framework at both the national and regional level is essential, with clarity of regulations and consistency in implementation.

- It is vital to invest in farmers through secure land tenure, equitable contracts and access to information and extension services.
- The promotion of rural development through community-based natural resource management can foster sustainable development. Empowering change through building the capacity of local communities will enable a shift away from expensive and environmentally harmful chemical inputs of fertilisers and pesticides. A shift to more efficient and diverse agricultural production and energy alternatives will allow these communities to be more resilient to economic and environmental shocks. It would place the community at the center of change.
- The investment framework for agroenergy alongside monitoring of the agro-industrial production processes is vital. Thailand should join with other Mekong governments to undertake proactive national commitments to improve labour and environmental conditions in the agroenergy sector. This would enhance investor confidence and competitiveness in the global market place and form the basis for good business and agroenergy practices. Brazil initiated such a model for a *National Commitment to improve labour conditions in sugarcane activities* in September 2009.
- Mekong countries could develop certification for a *Social Fuel Seal* building on the innovative Brazilian *Selo Combustível Social* to stimulate social inclusion of smallholders in a vertical supply chain for agroenergy. This could include tax incentives for agroenergy producers who source their feedstock from smallholder cooperatives, and access to financing for research and development for agroenergy innovation.
- Adapting and mitigating impacts from climate change will be a priority for countries in the region. Increasingly trade will encompass the carbon footprint of products, necessitating the proactive development of certification and labelling of energy use and greenhouse gas emissions along the production process. As environmental tipping points are more visible (for example water shortages in the Mekong river, loss of agrobiodiversity), the perception of risk will change quickly. The profile of risk is higher in the Mekong because of its rich biodiversity, virgin forests and reliance on environmental services to sustain livelihoods (water for fisheries and forests for non-timber forest products).

- Trade in agroenergy is likely to play a significant role in the agricultural transition towards industrialisation in the Mekong – if current policies prevail. As argued in this research based on the evidence gathered, small-scale integrated bioenergy will require major institutional innovation at the regional level. There is broad scope for the creation of regional mechanisms to advance public goods. A *Regional Sustainable Development Expert Roster* could be instrumental in tipping the balance in favour of sustainability and providing local expertise from a regional perspective. An expert roster could form the basis of a broader Mekong effort to guide trade and investment in its rich natural resources base as a foundation for prosperity.
- The opportunities for Thailand to gain from the experience of other developing countries to capture efficiency gains from biomass remain a largely untapped potential. Efforts by Thailand and Brazil to stimulate a two–way experience sharing to enhance not only sugarcane production in Thailand, but also stimulate cassava research in Brazil – an area in which Thailand has excelled over the past decade to become the world's leading tapioca exporter. South-south cooperation between the Thai Tapioca Development Institute and the Brazilian Embrapa would be facilitated by finalising the Memorandum of Understanding between Thailand and Brazil on agroenergy.
- The lack of political support for biofuels at the international level is one of the main constraints to be addressed in order to allow for those developing countries, such as Thailand, which have suitable domestic conditions to develop bioenergy. While producing biofuels may not be a long-term strategy for a low-carbon economy, it may represent a step forward for some developing countries to use currently available technology and resources more efficiently.

7.4 Further research needs to embed sustainable development in the Mekong

The time is now for Thailand to lead the way towards a renewable energy future for the Mekong region. This entails making informed decisions on the major issues that confront the Mekong region countries collectively and raising public awareness and acceptance on such issues as energy security, renewable energy options and the need for collective water management. To this end, further research is required to bring more detail and depth to the

factors of sustainability that underlie the development of agroenergy in Thailand. This research should include a deeper investigation of the terms and conditions of Thailand's agroenergy investment in neighbouring Mekong countries.

Policy-oriented research to build on the findings in this thesis would include theoretical and empirical analysis. It would be worthwhile to add to the case narratives from the field as a basis for targeted policy guidance based on empirical reality. It would be essential to approach the development of biofuels from a comprehensive perspective integrating the various and diverse areas encompassed by any solution to this challenging policy nexus.

Further research needs to link policy changes to changes in outcomes. These outcomes include for example the effects of fuel tax reform, environmental regulations, and consumer awareness and information. Cross-country comparisons would allow lessons to be learned to elaborate resource efficient and effective pathways for developing countries such as Thailand to make the transition to greater use of renewable energy. These comparisons are particularly relevant between developing countries such as Brazil and Thailand. Importantly, cooperation urgently needs to build crop resilience and maintain agro-diversity through maintaining a diversity of local seed varieties.

Prospective visions based on scenarios or other modelling tools would shed light on the current trajectory and the magnitude of the changes needed. Moreover, the conceptualisation of future directions would assess how those changes can be put in practice. This entails the need for further work to bridge the gap between theory, policy and practice based on local knowledge and conditions.

The environmental costs and benefits as well as the impact on greenhouse gas emissions will need further study for bioenergy. This could usefully include an assessment of the viability of projects under the Clean Development Mechanism to stimulate greater efficiency in the use of agricultural residues for biogas, as well as the development of second generation biofuels. It will need to take into account climatic change and the availability of land and water. Evidence suggests that the framework of community-based natural resource management is a sustainable model for the agricultural sector. The ecological connectivity of the Mekong needs to be better understood as a driver of cooperation to protect environmental public goods (water, forests, biodiversity, agrodiversity), as well as people.

7.5 Conclusion: orchestrating a regional modernity

Agroenergy is a critical issue on the sustainable development agenda in the 21st century. It is likely to remain as controversial as it is central to trade, environment and development. This thesis has illustrated the importance of developing an alternative regional model built on a new paradigm of modernisation. The policy options Thailand chooses to implement to deal with food and energy security will change the agricultural landscape of the Mekong region. This research emphasises the conceptual parameters of regional modernities. That is to say, a more fundamental paradigm shift would be better orchestrated from a regional perspective in order to provide coordinated and sustainable agroenergy development. This would enable greater flexibility to engage local communities to improve livelihoods and implement sustainable agriculture and energy efficiency through the policy option of *small is smart*.

This thesis reflects on the lessons that emerge from an investigation of Thailand's development and potential trade in bioenergy in the Mekong region. These lessons are found between the extremes; the reality is neither the unmitigated success that some observers depict, nor the failure that other critics describe. The lessons – many of which are still in the process of being understood – have wide relevance, not just for Thailand, but also for other developing countries tackling rural poverty, energy security, economic and land reforms and environmental sustainability.

As Mekong countries struggle to find a strategy for commercial agriculture in the 21st century, the evidence reveals that the choice may be found between: (1) approaches that emphasise smallholders and ecology; and (2) strategies based on large investor, monoculture plantations for export. This research supports the emerging literature which suggests that there are multiple benefits from integrating smallholder farmers in a regional shift to embrace renewable energy sources and build low-carbon economies through agroenergy.

Based on the assessment in this thesis, the policy landscape for bioenergy is likely to change for three key reasons: First, environmental concerns are coming to the fore in the Mekong, with rising levels of awareness. Second, the prospects for higher prices due to long term rising global demand relative to supply will spur interest in alternative materials to substitute those currently produced from oil-based chemicals (fuel, plastics, and fertilisers).

Third, China's growing demand for resources, including agroenergy inputs will increasingly shape the unfolding process of modernisation in the Mekong. This pressure necessitates a coordinated strategy among Mekong countries to preserve the *regional policy space* for socio-ecological sustainability to ensure prosperity.

A regional vision towards sustainable development lies in investing in agricultural productivity alongside increasing technological efficiency. Investment in the region's comparative advantage is best accomplished with coordination and the construction of a regional renewable energy matrix. Agroenergy, therefore, represents a partial response. Using the success of the Brazilian ethanol experience as a model, Thailand should produce biofuels, first and foremost, for domestic consumption to meet its renewable energy targets by 2020.

This research addresses Thailand's options to implement trade and investment integration in the Mekong region in the bioenergy sector, going beyond the country's past practise to "grow now and clean-up later." It outlines a way forward in the pursuit of implementing sustainable development in bioenergy. Thailand has experienced a prosperous path to development over nearly five decades. Yet, the environmental cost of Thailand's export-led growth trajectory challenges the policy making community to critically rethink what development entails. It places an emphasis on crafting a regional modernity based on a more encompassing conceptualisation of development that incorporates socio-ecological consequences. These costs and the patterns of resource use – many of which remain externalised from the decision-making process – are cause for concern and reflection.

There is scope for Thailand to sustainably develop bioenergy in the Mekong region. However, based on the evidence collected, there are several significant conditions that need to be fulfilled to ensure sustainability. The policy options put forward in this thesis constitute Thailand's *policy space* – in other words, the flexibility that exists to put in place domestic policies – to implement sustainability in the agroenergy sector. This policy space is constrained by the broader framework of globalisation.

The issues raised in this research surrounding one aspect of the energy agenda will dominate the policy framework of Thailand as it seeks to reconcile economic prosperity with a broad range of critical development and socio-ecological issues. Continuing with a development paradigm obsessed with economic growth is likely to result in the collapse of the system. Moreover, the pressure to address the growing threats of climatic change will require

unprecedented policy coordination between and within governments. It will necessitate regional coordination – sooner or later. Climate change is rapidly moving up the political agenda. The way forward is to embed sustainable development across the policy spectrum to enable not merely reform, but transformation of national policies coordinated at the regional level.

Thailand has a leadership role to play in transforming the current framework into new policies and planning in the Mekong. If countries in the region are to forge new partnerships to address the economic, social and environmental implications of reform, they are more likely to succeed if small-scale farmers are integrated into a regional landscape of modernity. This will require, above all, political will and financial support.

This research has implications for policy making at all levels of government and civil society, as well as the private sector. As these actors interpret globalisation and contribute to constructing a regional modernity in the Mekong, the findings of this research serve as a timely input on the need for action in a dynamic region of the world. The Mekong would benefit from Thailand's leadership as it forges links that for too long have been mired in controversy and hostility. The ultimate driver towards sustainable development is knowledge and a better understanding of the human relationship with nature.

7.6 Epilogue

In an attempt to provide a comprehensive perspective on the prospects and policy options for Thailand's trade in biofuels in the Mekong region, this research approaches the issues from multiple angles. This research has attempted to deal with the complexities of the agricultural and energy sectors in combination with the environmental, economic and trade implications of their development. Through this interdisciplinary approach, I have tried to better interpret the crisis that emerged in the summer of 2008 that pitted food versus fuel and led to the unravelling of much of the unmitigated promise of biofuels. Moreover, I have tried to understand the evolution of the biofuels debate from a Thai perspective and to situate that experience in the context of the Mekong region. The purpose was to place the evolving Thai bioenergy narrative in the context of globalisation as well as regionalism. To this end, I have interviewed government officials at all levels, cassava and oil palm agronomists, scientists and economists, technicians and workers, farmers and CEOs.

Over the course of these interviews and particularly during the field visits, I have not only unearthed a mountain of information on agroenergy crops and their place in the economy and environment of Thailand, but discovered a region of great diversity and local awareness. Moreover, my relocation to Brazil allowed me some perspective and a worthwhile point of comparison, given the richness of the Brazilian bioenergy experience. The vast expanses of sugarcane plantations in the Cerrado and state of São Paulo contrasted so dramatically with small-scale cassava and palm oil cultivation in Chumpae and Aoluk, Thailand or in Pakse, Lao PDR.

In highlighting certain aspects of the bioenergy debate in a selection of cases for this research, I have certainly left out some elements and neglected others. Recognising this inherent concern, the objective was to map out the broad contours of the debate in a way that is as concrete as possible. It reveals a path forward for sustainable agriculture and energy (agroenergy) development in Thailand and the Mekong. The preparation of this research has given me the privilege to better understand the landscape of the trade, sustainable development and agroenergy policy nexus – one of the most significant areas of study of the 21st century. I have done so in two of the most diverse and dynamic regions in the world, where there is evidence of a sustainable path forward to contest the business as usual development paradigm.