Submission No. 22
Van der Sommen, Frank Tiwi

A vegetation management perspective on dealing with climate change in the "top end" of the NT

F. J van der Sommen (BSc (Forestry) ANU , MEnvSt (University of Adelaide, PhD candidate CDU)

Introduction

The issue of climate change impacting on the NT, as a consequence of anthropogenic gas emissions into the atmosphere, although extensively modeled globally by the IPCC still present problematic when it needs to be addressed locally. Climate change, and its local impact is a more complex problem than just an increase in greenhouse gasses and accompanying temperature rise and involves a number of other interacting forcing factors and processes. These factors arise from processes both outside of planet earth and within, at the global, regional and local scale and are difficult to incorporate in a comprehensive climate models, making local prediction and meaningful response strategies, difficult.

Climate and weather in the "top end" is influenced by both by periodic shifts in the "intertropical convergence zone" where solar radiation induced convection and the associated pressure gradients contributes to three major circulation systems the Hadley cell which dominates dry season weather the monsoon cell bringing moist warm wet season wind and rain, mainly as thunderstorms and cyclones , and the east - west Pacific based Walker circulation system contributing to El Nino Southern Oscillation which unpredictably interferes with both .

Increasing climate complexity is associated with solar variability, linked to both shifts in the earth axis of ration and i elliptical path around the sun, together with sunspot activity which cannot be ignored in such models, creating more uncertainty.

Finally landscape change in the NT contributing to heat absorption, long wave radiation emission and refection (albedo) can alter climate at a local level . It is at this level that local action can make a real difference. Such local action also includes minimizing the inevitable impact of climate change, such as in crease in temperatures and more intense storms, are particularly important where global responses to reduce greenhouse gasses will have little impact in the foreseeable future. Currently we are attempting to close the atmospheric "stable door" after

the climate "horse has boilted" To deal with the consequences of climate change, while contributing to the amelioration of forcing factors requires more detail understanding on local effects.

Darwin climate trends

Analysis of measured Darwin climate trend from the Bureau of Meteorology as part of my PhD (In progress although un reviewed information can be made available) provides some indications of what options are available. The data from 1888 support the post war cyclic increase in temperature peaks which however was preceeded by a decrease up to 1940's. The impact on the hdrological regime is less clear suggesting increase in wet but not dry season rainfall, increase in night time relative humidity (but not day time) and increase monthly wind velocity, thunderstorm frequency and possibly cyclone intensity

Bearing in mind these climatic trend, a "bottom up" policy and strategy, for the monsoonal top end , which attempts to buffer, and adapt to, the impact of such local climatic phenomena, while contributing to the reduction of global greenhouse accumulation, seems most appropriate. Elements of such a strategy needs to include the following

Dealing with climate Trends

Population policy

Population levels need to be compatible with available resource of food and water. Having a population policy geared towards increasing consumers and labor, based on the economic principles of "sustained growth" is doomed to ultimate environmental disaster.

Moving economic and political refugees (generally the same) from over-exploited and degraded landscapes is short sighted and ONLY transporting the problem. I realize the NT has little to contribute to this debate but the constant rhetoric on the need to populate the north accompanied by platitudes about "sustainable development" when the evidence of environmental deterioration is increasing, suggests that little has been learnt.

Food production and land use policy

Food is a carbon sink as well as a source of nutrition affecting community health. The policy of globalizing trade in food and fiber runs counter to both the need to reduce carbon environmental and economic cost, and not to mention the health implication of lost nutrition and the associated social and economic consequences This policies also ignore the ramification of climate change on water shortages in food production

areas as well as increase energy costs, nutrient decline and pollution risk which threaten future nutritious food production. The isolation of the NT makes this a particularly important issue. Unfortunately impoverished soils and highly seasonal climate places some restriction of food production potential, requiring more committed research both on land capability and innovative farming.

It is ironic that good agricultural soils, such as the "Berrimah Sandy Loam" of Berrimah farm, which is at a premium near population centers is about to be committed to housing. Such land should be set aside for future low carbon footprint and more nutritious food production systems.

Strategies for overcoming soil limitations through organic (carbon rich) supplementations e.g. from composting or carbonizing invasive weeds and utilization of human effluent. Indication are that water will not be limiting providing population levels are managed enabling agriculture to be managed as both wet season and dry season irrigated systems . Indications are that dry season irrigation provides an opportunity for the cultivation of many even temperate food crops. The wet season is better geared for tropical annuals. Careful breeding and genetic engineering can no doubt improve the options available. Such cropping systems, integrated with perennial wet season adapted, perennial plants such as trees, may form the basis for a more appropriate, alternative, agricultural systems. More creative research needs to be directed towards this end.

Residential development and greenspace policy

Dealing with the space where people live in urban areas provides another important area for climate change policy development. The current push towards high rise, energy dependent, residential development in Darwin, already threatened by stronger winds and cyclone, is challengeable on both environmental, social and economic grounds, particularly where such developments are at the expenses of green space. Heat island , wind tunnel and other urban climate effects accompanying such developments are well documented and pose a threat to the quality of urban environment. There is mounting evidence that such intensive urban development, although reducing some infrastructure and transport cost, leaves a higher carbon, as well as other environmental and sociological "footprints", than well managed suburban development.

I am arguing here in favor of the suburban, treed, house allotment "ecosystems" where well informed individuals take greater responsibility for dealing with local climate change. I am not arguing for larger more

energy dependent houses on smaller allotment with less tree space, which is the current trend and, is not sustainable.

Space for shade and transpiring trees enhances domestic cooling and also provides screening against noise . Smaller houses, well spaced , designed for ventilated, reduce both cooling (energy) costs and minimize neighbor conflict particularly where windows are left open for ventilation. Such house allotments can also be used for food production (following on from innovative agricultural) thereby increasing house hold health and wealth, while also enhancing psychological well being. The physical and mental benefits of such urban "green space" policy are well documented. Finally my research indicates that such cover if well managed can provide protection against flying debris during cyclones.

Vegetation management options

Native tree cover management, mainly through appropriate fire regimes has been advocated as a potential carbon sink for the NT. There is no doubt that unburnt monsoon rain forest assimilates CO_2 , the net assimilation being linked to growth and vigor. Mature forest loose most of the CO_2 in decomposition and respiration. Burning of the more extensive Eucalypt dominated woodland, particularly drying grass is a major contributor of green house gasses which it is argued are re assimilated by post fire regrowth. With cool fires trees play only a small role. The CO_2 assimilation in the more efficient C4 grasses and less efficient C3 trees is governed by the availability of soil moisture and a range of soil nutrient both of which are limiting, particularly in the dry season. Frequent burning of organic matter a major source of these nutrients appears to lead to accelerated nutrient depletion , (or entropy in accordance with the "Laws of thermodynamics"). These nutrient accumulate in both the atmosphere and are also leached to water bodies, following intense rainfall. Some are returned but most are lost from ecosystems.

There are no doubt that there are good ecological and sociological arguments for such burning practices, although some ecological arguments are spurious . It would appear that "Natural", lightning induced, late season fires, with follow up rains, for example, although risking greater canopy damage, enhances rapid seed regeneration, fostering species adaptation to climate change . Escaped fires this time of the year also burn into wetter fuel conditions reducing area affected. Replacement of such fire regimes with unnatural, "anthropogenic", early dry season fire regimes, although less likely to cause canopy damage, nutrient loss, as well as reducing fire hazards for humans, are also less likely to lead to seed regeneration and tree adaptation. Such fire more likely escape and be prolonged in increasingly drier fuel. In both cases

organic carbon, and essential nutrients loss, is inevitable. To justify burning, on ecological sustainability grounds, therefore needs to be based on more objective research which takes all ecological factors into account.

Cultivated of plants, be they in parks, orchards home gardens and agriculture generally, where nutrient and moisture constraints are removed, and fire is precluded would appear to make a greater contribution to carbon assimilation and accumulation per unit area. Organic matter accumulation and its breakdown as soil carbon, in such plant communities, enhances nutrient and carbon storage in both plants and soil further improving soil fertility, and increasing tree growth and sequestration rates. Establishing a management regime of tree harvesting and utilization, in a form of urban forestry, to prevent CO_2 loss, maintaining tree vigor, as well as regulating tree size to minimizes their cyclone hazard, provides a potential "win win" situation. This presents an urban research and planning challenge for cities such as Darwin.

Conclusion

There is no doubt that some of these matters can be addressed in economic models, which appear to under pin this current climate strategy. If not, alternative evaluation systems will need to be developed if a truly holistic or ecological systems approach, to deal with climate change in the northern part of the NT, is to be developed. This requires both research but also action based on a committed program of community awareness raising and education across agencies concerned with this multifaceted issue.