



# OPTIMISING FUTURE TROPICAL

## EXAMINING THE ECONOMIC BENEFITS AND ENVIRONMENTAL COSTS OF ROADS IN

MASON CAMPBELL (MOHAMMED ALAMGIR AND WILLIAM LAURANCE)

### MY COMMUTE

On average, I drive 90 kilometres per day to-and-from my place of work. I begin my commute on the highland plains of the once rainforest-shrouded Atherton Tablelands. My journey then traverses a rural agricultural matrix, passing remnant patches of tropical savannahs, monsoonal vine thickets and evergreen rainforests, until I arrive at my place of work, James Cook University, near the city of Cairns, one of Australia's few truly tropical cities, located in the far north of Queensland. Cairns can be found on the humid-tropical lowland plain, and it is these lowlands that Mohammed's shorter journey to work crosses as he passes the ever-expanding urban sprawl

and the still relatively extensive fields of towering sugarcane gently swaying in the coastal breeze.

My daily route to work bisects the deep-green, world heritage listed rainforests whose vegetative abundance conceals the ruggedness that is the Macalister Range. This imposing mountain range provides a glorious backdrop to our university and constitutes part of Australia's renowned Great Dividing Range whose precipitous ridges once formed an impenetrable barrier preventing the early European settlers who inhabited the mesic eastern coastal plains from accessing the arid interior of the continent. The road I take was

originally devised as a means of gaining access to the mineral-rich mining towns of the interior to feed their insatiable need for daily goods while transporting their metallurgical spoils to the navigable ports of the eastern seaboard, such as Cairns. Equivalent with many roads penetrating the once vast wilderness regions of the World's tropics, the opening of this route resulted in the extensive development of the interior through diverse economic endeavors including substantial agricultural intensification. This development led to an economic empowerment of the local populace, a major reason given for tropical road construction to this very date, but



# ROADS

## THE ASIA-PACIFIC

occurred at the expense of extensive tropical forest loss and significant environmental degradation.

Today as I wind my way through the multitudinous switchbacks allowing my passage of the steep terrain I am contemplating the economic benefits and accompanying environmental havoc wreaked by the presence of tropical roads such as the one upon which I presently journey. In my reverie, I would like to imagine that many of my more enlightened fellow travelers accompanying me along this route may be at least contemplating the environmental impact of our combined vehicular emissions, though

whether this is the case or not I do not know. But one thing I can be relatively confident of is that few if any of them, would be wondering whether this road should even exist at all.

### ROAD LOCATION; COSTS AND BENEFITS

Have you ever stopped to wonder about the road you're currently driving on and why it exists in its present location? Or indeed, whether this placement would maximise economic outcomes while minimising environmental harm? If not, don't feel chastened, I'm sure you are amongst the vast majority of road users world-wide. Now if you are wondering why such pragmatic if not melancholic quandaries inhabit my and Mohammed's grey matter it is because we constitute part of a dedicated research team, led by Bill Laurance and based at James Cook University Cairns. The team has undertaken the behemoth endeavour of examining the environmental cost and economic benefits of potential future roads throughout the developing tropical nations of Indonesia, Malaysia, and Papua New Guinea. Collectively, these three countries house some of the world's most imperiled ecosystems and are major hotspots for biodiversity and endemism.

### COSTS

Unfortunately, the very existence of many species in these countries is threatened by the unprecedented investment in transport infrastructure expected to flood the world's tropics over the next few decades. In fact, it is projected that by 2050 there will be an additional 25 million kilometres of paved roads on earth which is enough to encircle the planet 600 times. And around nine-tenths of these roads will be built in tropical developing regions.

As tropical forests around the world are vanishing at a rate of 50 football fields a minute and wilderness areas have shrunk by a tenth globally in just the past two decades (with the biologically rich rainforests destroyed the fastest), this planned additional road development is an environmentalist's worst nightmare. In fact, eminent ecologists such as the Brazilian Professor Eneas Salati (who has spent his life studying the Amazon) have been known to suggest "the best thing you could do for the Amazon is to blow up all the roads."

Now if you think his views are somewhat extreme consider this: in the Brazilian Amazon alone 95 percent of all forest destruction occurs within five kilometres of roads, and for every kilometre of legal road, there are at least three kilometres of illegal roads! Not only do these roads penetrate once pristine environmental regions causing localised damage through their initial construction but they unleash a cascading chain of ongoing environmental degradation. This degradation occurs through processes such as increasing fire penetration, increased illegal hunting, illegal forest clearing by land speculators and increased illegal mining to name but as few.

Now before you disregard another impact assailing the ever-threatened Amazon, note that many of these effects are Pan-tropical and impact all of the major remaining wilderness areas in the tropics including Australia. For instance, in the Congo Basin, the toll on wildlife of increased illegal hunting through access provided by road construction has been devastating. In the last decade, for instance, around two-thirds of all forest elephants have been slaughtered for their valuable ivory tusks.

### BENEFITS

But as any economist will tell you **we need roads**. They are an indispensable part of modern societies providing a cost-effective way to promote economic growth, encourage regional trade and provide access to natural resources and land suitable for agriculture. They are also used to shore-up a countries retention of disputed geographic regions. Partially to fulfill this insatiable need for roads, in 2014 at their global summit, the Heads of State of the G20 nations committed to investing US\$60-70 trillion in new infrastructure worldwide, by the year 2030. If this were to occur as planned, this would not only be the single largest financial transaction in human history; it would more than double the present value of infrastructure globally. Now while the proportion of this which will be supplied to tropical countries is currently unknown, any investment in developing tropical countries is

**Above:** Many fauna species throughout the tropics are threatened by direct collision with vehicles (Image courtesy Brazilian Ecology Road Center).



Most of the remaining rainforest within the Australian tropics is to be found on the steepest mountain slopes with the flatter regions long since cleared for agriculture and urban development.

laudable as many of them house some of the poorest citizens in the world. Moreover, the citizens of the world desperately needs **tropical roads** in particular because the tropics currently house approximately 40 percent of the world's population, and 55 percent of its children under five, but by 2050 it is expected that more than half the world's population and a phenomenal 67 percent of its young children (under five) will reside there! However, if this infrastructure investment is to reach its maximal benefit, it must occur upon a solid base of careful planning. Poorly planned road building could not only impose massive environmental degradation but deliver negligible economic benefits. So the crux of the issue becomes determining how we balance the two competing realities, on one hand, road construction for social development and poverty mitigation, and on the other road exclusion for the conservation of the crowning glory of natural diversity which is housed in the few remaining tropical wilderness areas?

That's where we come in... Bill's team is leading a major international research effort to devise a strategic and proactive scheme for identifying



The rainforests of the Daintree are some of the last tropical lowland forests in Australia that have avoided the impacts of an extensive road network.

and prioritising current road building projects across Indonesia, Malaysia, and Papua New Guinea. In concert with other colleagues from the respective governments and collaborating organisations (in particular NGOs), we aim to devise a national road map for each country which would identify areas in which roads or road improvements are likely to have substantial economic benefits at the lowest environmental cost. We have the major aim of facilitating effective and conscious road positioning by providing objective facts and decision support to our governmental collaborators. Thus the reason for my current reverie.

### CONCLUSION – HOMEWARD BOUND

So as Mohammed drives across the heavily urbanised and agricultural lowlands of Cairns and I head for the forest-cloaked mountain range and on towards my upland abode, I am still considering the many proposed roads in the tropical countries we plan to examine, whose aims correlate with the one built so long ago upon which I currently travel. But unlike those proposed for our study locations across the Asia Pacific, we no longer have a say in the position of the one I'm on. Nor the costs of its current upkeep and potential for expansion which both remain heated political topics today, so many decades since its incursion. Indeed, if the early pioneers who identified the current position of this road were endowed with today's technological capacity and array of economic and environmental assessment tools (and the willingness to use them), would it exist at all? However, as the saying goes, we missed that boat. Fortunately, this is not the case for the many proposed roads we are examining. And if we can assist our governmental collaborators in strategically directing the tsunami of road building proposed for these tropical regions, there is a strong likelihood that their future roads could maximise economic development for their young populace while striking priority conservation outcomes for centuries to come. But if this tsunami arrives undirected upon the tropical shores of the Asia-Pacific all that may one day remain will be the historical "what if" musings of a fellow tropical traveler on their daily commute a century from now.



The clear mountain streams of upland catchments are often threatened by the impacts of road construction, facing sedimentation and altered drainage patterns.



Mitigation measures such as these rope bridges across the Palmerston Highway in tropical far north Queensland, can assist in ameliorating the impacts of tropical roads on arboreal fauna species.