Deconstructing a myth - Identifying ATVing's Health, Environmental, Economic and Social impacts.

By

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Executive Summary

In response to claims by the Nova Scotia Government largely through its Department of Health Promotion and Protection (HPP) and its associates, that recreational All Terrain Vehicle use (ATVing) is a healthy, active lifestyle that also brings environmental and economic benefits to the province, this paper examines the scientific, policy and industry literature to investigate the validity of such claims and compares ATVing and snowmobiling with equivalent evidence from Active Transportation (AT). This review focuses particularly on Nova Scotia's rail to trail and AT policies that promote "shared use" which promotes ATVing and snowmobiling on trails also dedicated to active transportation. This paper is primarily a policy analysis grounded in a broad ranging literature review. It began in September 2007 and was completed in early July, 2008. It examined the literature catalogued in several scientific indexes, particularly PubMed and Sport Discuss, to compare the health, environmental, economic and social costs and benefits of ATVing and AT.

This study drew the following conclusions:

- **Healthy, Active Lifestyle**: The results clearly indicate a dearth of evidence supporting ATVing as a healthy, active lifestyle. In contrast, there is overwhelming evidence that ATVing creates a substantial health burden on participants, families and the Province and that the health benefits of active transportation far exceed any costs attributed to active transportation.
- **Environmentally Friendly Recreation Activity**: There appears to be little or no justification, based on the available scientific evidence, for believing that ATVing is environmentally friendly. On the contrary, there is substantial evidence that ATVing causes extensive environmental damage to our landscape, particularly within pristine landscapes, and on a per user basis both ATVs and snowmobiles contribute substantial emissions into our atmosphere. In contrast, active transportation is seen as an important way to wean automobile drivers away from cars, at least for short trips in reasonable weather. This substitution reduces greenhouse gas emissions which also help to safeguard environmental quality.
- **Economic Benefits:** While numerous claims are made by the ATV and snowmobile industry and users that ATVing and snowmobiling bring important economic benefits to the Province, these calculations largely focus on economic activity rather than on the costs and benefits. When full cost accounting is considered, such claims appear dubious as gross economic sales leak substantial revenue to suppliers located in Quebec, the USA and abroad. In addition, the estimates of health care and environmental costs of these activities are substantial. On the other hand private and public investments in active transportation are considerably smaller on a per capita basis and the relative economic benefits, especially in terms of health care savings, the indirect savings from greenhouse gas and environmental damage reductions, as well as the benefits derived from tourism development are substantially larger.
- **Social Benefits:** Here the evidence is equivocal. Anecdotal evidence suggests that ATVing and snowmobiling are fun and social activities that bring social benefits to participants. This must be considered; however, against the tremendous social

costs of trauma and death particularly resulting from ATV morbidity and mortality. In addition, the social costs to communities adjacent to ATV and snowmobile trails, whether dedicated or informally used, must be evaluated in the context of the noise irritant and associated health damage, other types of users displacement because of safety concerns, and the nuisance and danger of illegal access across private lands and public highways. In contrast there is considerable evidence of social benefits resulting from active travel, and any social costs attributed to active transportation are much smaller and the net social benefits much larger.

Public Policy Considerations:
Given the overall weight of evidence, the authors conclude that there is little or no justification for the Nova Scotia Government to support ATVing or snowmobiling as a healthy, active lifestyle on either health, environmental, or economic grounds, and the evidence provides sufficient concern that any social benefits attributable to these activities are substantially outweighed by their social costs. Based on risk analyses conducted in numerous epidemiology studies throughout North America and elsewhere, ATVing is considered unsafe for drivers of any age but particularly dangerous for children, youth and young adults.

ATVing is damaging to landscapes and to the atmosphere. Given the government's commitment to concrete reductions in greenhouse gas emissions, to reducing pollution and to protecting pristine landscapes, as expressed in its Environmental Goals and Economic Prosperity Act (2007), the government's support of ATVing and snowmobiling appears to be in direct contravention of this legislation's intent.

Given the dubious claims for economic and social benefits, and the absence of health and environmental benefits, there is little or no justification to suggest that recreational ATVing and snowmobiling can be a considered a public good warranting public funding and support. Neither can recreational ATVing and snowmobiling be considered a merit good (where there is shared benefit between private and public interests) as no public interest can be demonstrated. In falling short of banning recreational ATVing and snowmobiling outright as a consequence of their health and environmental costs, these activities should be considered a private good where all the costs and the provision of recreational settings should be borne by the private sector. The public interest is served only by appropriate regulation and enforcement.

The recent political turmoil triggered by the Nova Scotia government's policy to fund a learn-to-ATV program for children and youth, can serve as a platform to transform its ATV and AT policies to conform to its Environmental Goals and Prosperity Act (2007) and at the same time, regain the Department of Health Promotion and Protection's public trust. It is recommended that:

Recommendations:
1. Given the need to consider active transportation as a key component of a sustainable transportation mix, the provincial agency responsible for

transportation in Nova Scotia, presently the Department of Transportation and Infrastructure Renewal, should take the key leadership role in Rail to Trails policy, and that active transportation pathways be treated as an integral part of the legitimate transportation mix and not be merely considered a peripheral recreation activity. Active Transportation infrastructure and operations should be funded accordingly.

2. In concert with the above, the Province should reformulate its Rails to Trails policy to ensure that its abandoned rail corridors remain available for future rapid transit development. In the interim, given the poor state of population health in Nova Scotia, the Province should dedicate the primary use of abandoned rail corridors to active transportation where recreation is an important secondary use.
3. In addition, the Government should clearly dedicate its recreation trail development policy to active transportation. Active transportation corridors should be managed and funded directly by the Nova Scotia Department of Transportation and Infrastructure Renewal.
4. Given the health and environmental costs of ATVing the role of the provincial government should be one of regulating and monitoring not promotion.
5. Given the extreme risk of ATVing, recreational ATVing should be restricted to children 16years and older, and adults who hold a valid driver's license as well as specialized ATV instruction and certification.
6. Given the public's concern regarding ATVing and the need to enact strategies that further the Environmental Goals and Prosperity Act, an immediate moratorium should be proclaimed on the public funding of ATV and snowmobile trails and programs.
7. Recreational ATVing and snowmobiling should be considered a private good (as opposed to a merit or public good) and while carefully regulated for safety and environmental practices, ATVing and snowmobiling should be funded fully by the private sector on closed courses of consenting private landowners with proof of adequate third party insurance, and the requirement for local government planning permission.
8. Minimum standards should be developed for ATV emissions. Retrofitting of low emission engines and fuel systems should be phased in over three to five years.
9. Based on the available scientific evidence the Department of Health Promotion and Protection should make a clear statement of the health and environmental benefits and costs of ATVing and snowmobiling.
10. We finally recommend that the government make clear the relative worth to Nova Scotia society of ATVing and snowmobiling compared to Active Transportation and direct its financial and programming resources accordingly.

Introduction

The recent public protest over the Nova Scotia government's decision to teach children as young as six years old to drive ATVs (Smith, Chronicle Herald, June 19, 2008), has brought to the surface just a glimpse of the government's ATV promotion strategy and its concerted efforts to undermine active transportation such as walking an cycling. Given the increasing concern and urgency over climate change, the adoption of the Environmental Goals and Prosperity Act (2007), the evidence for endemic chronic health problems as a result of sedentary living, and given the expressed mandate of HPP, the question looms how the Nova Scotia government can justify its ATV and snowmobile policy. Both are well recognized as dangerous and environmentally destructive.

The proliferation of All Terrain Vehicles (ATVs) and snowmobiles for recreation has heightened conflict and debate over who should have access to various trails and pathways in Nova Scotia. Over the past decade or so, the Government of Nova Scotia has advocated "shared use", meaning shared with motorized recreation vehicles, within abandoned rail corridors which has increasingly frustrated community volunteers working to promote active, healthy and environmentally friendly active transportation. Some of these volunteers have joined forces to challenge the legitimacy of the government's present policy position. Until recently the Nova Scotia Department of Health Promotion and Protection (HPP) has aggressively promoted its version of "shared use" that ensures trail access to ATVs and snowmobiles. Interestingly, many trails pass through small towns, villages and hamlets while others snake through heavily populated areas.

This paper examines the basic mandate of HPP and the fundamental principles that are meant to guide its operations, and uses this as a framework to examine the logic of the government's "shared use" trail policy. Particularly this paper examines the efficacy of claims made by the Nova Scotia government, Nova Scotia's Off-highway Vehicle Ministerial Advisory Committee and their various associates, that ATVing is part of a healthy, active lifestyle, that it is environmentally friendly, that ATVing and snowmobiling provide substantial social benefits, and that they provide key economic benefits to the province, particularly through the retail and servicing of ATVs and snowmobiles, and that ATVing and snowmobiling also stimulate tourism.

To set the stage we briefly examine the underlying theory of trail conflict and the general evidence for "displacement" that sees certain users of public space dislocated and in some cases driven from participation altogether. We then review various government policies that are either directly or more obtusely connected to this issue, and then we systematically review the evidence that might justify the government's position supporting ATVing and snowmobiling. For comparison we use similar evidence about active transportation. We then weigh this evidence to determine whether the government's policy position supporting "shared use" and *de facto* ATVing and snowmobiling can be justified according to its stated health promotion and protection goals and the prevailing broader issues facing Nova Scotia, as expressed in its Environmental Goals and Economic Prosperity legislation. Finally we provide a set of policy recommendations for Government's consideration. We recommend that the Government make a clear statement reflecting the facts.

The Health, Environmental and Economic Claims of the ATV Community

Despite their acknowledged health risks and propensity to cause environmental damage, the Nova Scotia Department of Health Promotion and Protection and the Department of Natural Resources have remained staunch supporters of ATVing and snowmobiling, primarily through the administration of the government's "shared use" rail to trail policy and have gone as far as suggesting that ATVing is a healthy, active and environmentally friendly lifestyle that also provides important economic benefits. In a half page advertorial in the Chronicle Herald, Nova Scotia's Ministerial Committee for Off-Highways Vehicles extolled the virtues of building recreational trails for off road vehicles (Laurie Cranton, 2007). In an adjoining advertisement, the Recreation Vehicle Users and Dealers of Nova Scotia (RVUDNS, 2007) claimed that "tourism money is being lost to other provinces"; that they "want to see families get out and enjoy a healthy lifestyle"; that they "don't agree with restrictions on trails and roads that [they] have used for decades". They also argued that seven dealers closed their doors and thirty-eight workers went west to find work as a result of enhanced regulations. In addition, they claimed that "millions of tax dollars [are] being lost from a fifty percent drop in OHV sales and that tourism is going to other provinces where OHVs are embraced. Finally they said that they "don't agree to make youth ride on closed courses only" and assert that "children should be able to enjoy nature with their parents (RVUVNS, 2007)." A more recent declaration clearly carrying the Nova Scotia Department of Health Promotion and Protection's official logo; asserts that "studies show that ATVing is part of a healthy outdoor lifestyle" (see Figure 1). A request for references to the Nova Scotia Angling and Hunting Federation (NSAHF) backing this claim elicited a response 'that a study is in progress'! While obviously jumping the gun on the evidence, this brochure also claimed that "it's all good for you and for the environment that you are sharing your experience with."

By way of comparison a brochure published by the US Centers for Disease Control and Prevention (CDC, 2003) extols the virtues of Active Transportation (See Figure 2). It states:

> A Scientifically Proven Asset -- Scientific evidence from the *Guide to Community Preventive Services* shows that providing access to places for physical activity, such as trails, increases the level of physical activity in a community. Trails can provide a wide variety of opportunities for being physically active.

Given the confidence of the ATV community's claims and the contrast in focus of the CDC's and HPP's promotions, this literature review attempted to test the veracity of each of these claims.

Trail Conflict and Displacement

This section considers two concepts that provide a basic theoretical framework for examining trail use issues; they are recreation conflict and recreation displacement. Trail and pathway uses, whether employing similar or differing transportation modes for commuting, fitness or leisure can lead to conflict and possible user displacement. Such conflict sometimes leads to calls for restrictions. Koontz (2005) offers two complementary perspectives on trail conflict. The first considers various modes of trail

travel focusing on the level of technology employed; the second uses Jacob and Shreyer's (1981) conception of conflict that focuses on psychosocial variables.

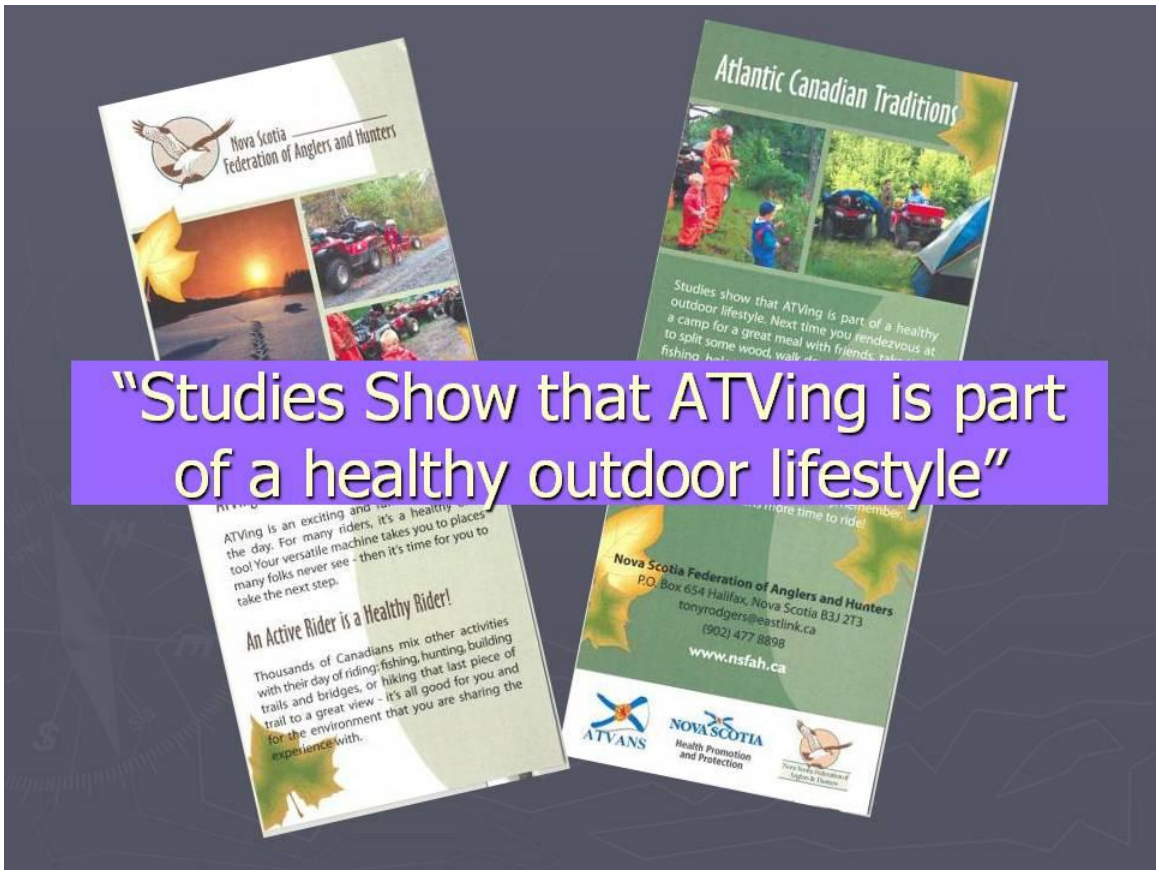


Figure 1: A Brochure Extolling the Health Benefits of the ATVing (NSAHF, 2008)

Koontz first indicates that walking requires no appreciable technology save decent footwear. Horseback riding represent the next available technology level where such travel provides substantial relief from physical exertion. A third travel mode is the bicycle which adds a mechanical advantage while the fourth is the motorcycle that requires no propulsion effort, and the fifth is the all terrain vehicle (ATV) or quad that takes away most of the need for balance. The uppermost technology considered by Koontz is the full sized off-highway-vehicle (OHVs) such as a Jeep or Land Rover which can add all sorts of comfort. Jacob and Shreyer (1980) suggest three possible roots of conflict regardless of the mode of travel. The first is setting based where; for example, one party uses a recreation setting for nature appreciation and another for high spirited social activity. A second results from differing activity styles which can actually occur using similar modes of transportation. For example, a group of club based ATVers strictly adhering to a safety code will be at odds with ATVers joy riding. This is considered "style" conflict. A third variation results from differing perceptions of crowding and solitude. For instance, one trail user or group may seek solitude while another may welcome frequent social encounters.

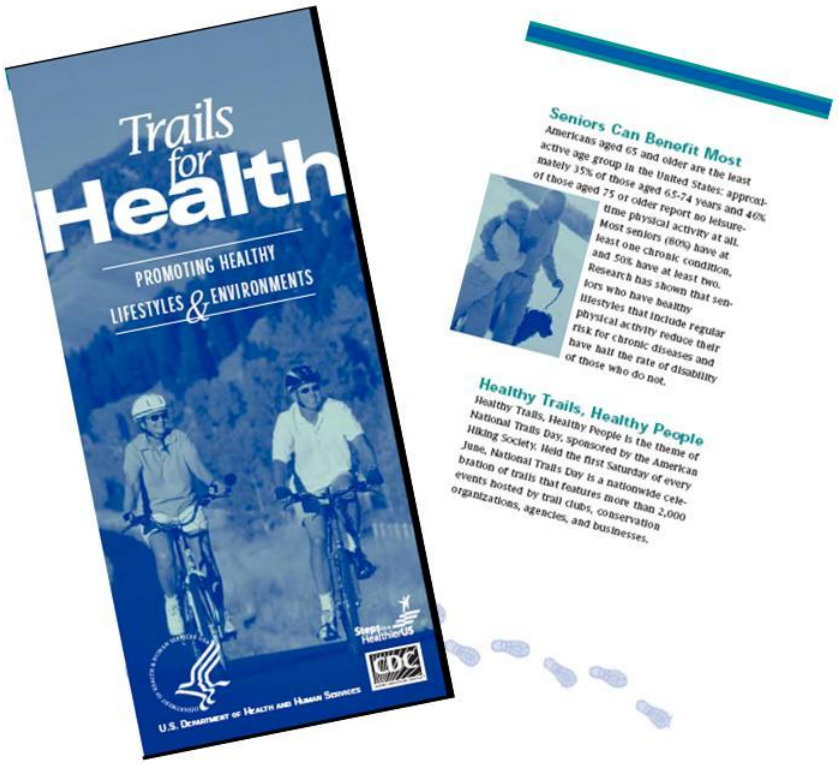


Figure 2: The CDC Trails for Health Brochure.

Combining these, it is conceivable that those using higher technology forms can be negatively impacted by simpler technology. For example, ATV users may be stressed when mindful of trail walkers. It is important to note that Koontz' model stresses that conflict is asymmetrical with those using simpler technology typically experiencing the greater negative impacts. Interestingly, ATV users regularly call for "equitable" trail use that allows them broad access to trail systems but do not acknowledge this uneven impact. To grasp the full significance of this asymmetry, it is necessary to not only consider the influence that different trail users have on each other, but also take into account the health, environmental, social and economic costs and benefits. One important consideration in understanding these relationships is "recreation displacement".

Short-term recreation displacement occurs, for example, when a walker takes evasive action to allow an ATV to pass (Arnberger and Eder, 2008). Longer term displacement occurs "when users leave either the site or area due to an unacceptable change in the social, managerial or resource conditions" (Schneider, 2000). Schneider argues that longer term "displacement not only requires unacceptable change, but settings that can be substituted." We prefer a modified conception that also considers displacement from an activity altogether when a suitable alternative is unavailable. For example, a child may be dissuaded by parents from using a trail to cycle to school as it is used by ATVs. In considering the impact of displacement, we consider the probable

impact of "shared use" on active transportation adoption rates which has consequences for healthcare, the environment, the economy and to social cohesion.

The Nova Scotia Policy Framework

Despite the fact the Nova Scotia Department of Health Promotion and Protection was apparently relieved of its responsibilities in the ATV arena, it remains useful to consider the general principles upon which the Nova Scotia Department of Health Promotion and Protection was formed as there is evidence that it is continuing to promote and finance ATVing. These have important implications for government policy in general. Its function, according to its official website, is to "promote and prevent illness and injury"; "create and sustain supportive environments for health improvement and healthy public policy development" and "support reorientation of health and other services to enable population health (HPP, 2007)." According to departmental statements, these functions are to be supported by best practices and are to be evidence based. Given their importance for all Nova Scotians, it is also important to consider how these goals are translated into policy action. We therefore examine the fit between the government's stated purpose and how this is translated on the ground.

In conjunction with the Department of Natural Resources (DNR), HPP has implemented a 'Rails to Trails' policy for over a decade (SRC/DNR; 1997). According to Government, this is to be driven by community based initiatives, consultation, cooperation and partnerships and is to remain in public ownership. This policy recognizes that these corridors often pass by or through private property necessitating the need for a 'good neighbor policy'. While ensuring public access, there is to be a balance between recreation use and landowner needs. In the absence of formal trail designation, an abandoned rail corridor may be barricaded to discouraged recreation use and without formal approval, motorized vehicles are banned. Until the government's abrupt shift in policy in June of 2008 (Chronicle Herald, 7th July 2008), rail to trail conversion could not proceed without contact with the Sport and Recreation Division of HPP who assessed a proposal's viability and if deemed feasible, worked with the proponent and DNR to move formal designation forward.

Two other policies of HPP are of particular note. The first is the "Nova Scotia Pathways for People: Framework for Action" initially introduced at an active transportation symposium co-sponsored by the Kieran Pathways Society of Kings County and Acadia University in Wolfville, Nova Scotia in November of 2006 (HPP, 2006). It ostensibly promotes active transportation but under the guise of "shared use" trails. A second policy statement of note is the Active Healthy Kids Strategy launched at the end of 2007. One objective is to "build support and encourage action that advances the active transportation movement" and "evolve Active and Safe Bicycle Routes to Schools to help children, youth, and families use active transport between home, school and other neighbourhood destinations (HPP, 2007)." These are worthy goals but must be seen as part of the government's policy to promote what they claimed as the healthy, active lifestyle of motorized vehicle recreation! A major weakness is HPP's failure to free active transportation trails from motorized recreation vehicles. "Shared use" with motorized vehicles is a major deterrent to promoting active transportation and is contrary

to the recommendations of the World Health Organization (WHO, 2004) that advocate separation whenever feasible (see also Ravenscoft, 2000 and 2002).

Other government policies play a key role in shaping access to trails. Notionally, private landowners are protected against trespass under Sections 38-42 of the federal Criminal Code (C-46, 1985). This legislation's authority in Nova Scotia is in practice confined to industrial, commercial and domestic real property and does not practically extend to forested lands. The Protection of Property Act was established to fill this gap (NS C-363) and its reach is also applied to active railway corridors but not necessarily to abandoned rail lines. This Act states that no motor vehicle is permitted to access private property without verbal or written consent by the landowner (section 8). Importantly this matter has recently become more restrictive in a legislative amendment to the Off-Road Vehicles Act (NS 323, 2005 C56). With this amendment much of the ambiguity of implied consent for off-road vehicles ostensibly within the Protection of Private Property Act, is now superseded. While the watered down amendments of the Off Highways Act apparently require written consent for motorized vehicles such as snowmobiles and ATVs, numerous regulatory changes since enactment make the true weight of the law unclear. Apparently, if the land owner refuses access over traditional routes, she/he must post signage clearly visible at all usual access points. Given the risk of a lawsuit when ATVs are permitted (legally the term is invited) on private lands, it is unclear why any landowner would agree. Regardless of the full reach of the law, a consequence is that ATVers' interest in securing and enhancing access to public lands has heightened.

Under the Occupiers' Liability Act (C27, 1995), the corridor owner is liable for the condition of the premises, activities carried out on the premises, and the conduct of third parties on the premises. The owner is also responsible for maintaining the premises to prevent danger or to provide adequate warning of the dangers and risk involved when accessing the premises. Under the specific conditions of tort law, the owner may be held responsible for injury or property damage sustained by visitors including that inflicted by one visitor on another. Thus, before the conversion of a rail corridor to a trail, owner liability and the interests of surrounding landowners must be addressed with full and clear understanding of all the parties involved. This typically means that adequate liability insurance must be obtained by the trail operators to protect the corridor owner. Given the potential for injury to a third party from a collision with an ATV or snowmobile, it is difficult to imagine a private landowner giving written permission for access without ironclad insurance coverage, which is likely to be expensive.

Beyond specific corridor concerns, it is important to consider how trail development is to be constrained or encouraged by the objectives of the Environmental Goals and Sustainable Prosperity Act (2007). This wide ranging act purports that the health of the Nova Scotia economy, the environment, and its people are all closely interwoven. For long-term prosperity, the environment and economy must be carefully managed to benefit present and future generations. This Act implies that "the management of goals for sustainable prosperity, such as emissions reduction, energy efficiency programs and increasing the amount of legally protected land will preserve and improve the Province's environment and economy for future generations". Within this Act specific goals have been laid out to decrease greenhouse gas emissions including transportation. This of course has important implications for the promotion and proliferation of motorized recreation vehicles as well as boosting active transportation.

Methodology

Our study was initiated to examine the evidence underlying claims by various Department of Health Promotion and Protection personnel that ATVing is a healthy, active lifestyle (pers.com HPP Personnel). This study represents an examination of the scientific literature and is framed by an overview of pertinent policy and associated industry documents. While this literature review examined several scientific indices, it drew most from two key sources. The first was Sport Discus which is a leading source of sport, recreation and tourism literature and PubMed, which is the largest single source of medical scientific literature. These and other indices were consulted several times from September 2007 until July, 2008.

Several key words and limiters were used in various combinations to source relevant research reports such as all terrain vehicle (ATV), off highway vehicle (OHV), active transportation, mountain biking, cycling, trails, social capital, economic impact, health, health benefits, health costs, health burden, economic burden, trails, community trail use, physical activity, physical inactivity, health risks, ATV legislation, trauma, pediatric trauma, cardio vascular benefits, injury risk, and air pollution.

We examined the abstracts of available articles and if appropriate, saved the citations to a dedicated bibliography. Because of the financial limitations and hence time and interlibrary loan constraints, only those abstracts and articles available electronically through Acadia University's extensive on-line system were retrieved. This allowed the researchers to scan for key words and phrases. Those articles that were of particular interest and provided unique insights were examined in depth. As several articles covered similar ground such as epidemiology studies of ATV trauma or ATV economic impact studies of various US states, only examples were consulted in detail (see for example: Shults et al., 2005).

Health, Environmental and Economic Impacts

The Health Benefits and Costs of Active Transportation (AT) and ATVing

According to Campbell (2004) active travel provides

> many societal and personal benefits. Most of these benefits also have a positive economic impact. Active transportation consists of human-powered forms of travel such as walking, cycling, using a wheelchair, in-line skating, skate boarding, cross-country skiing, canoeing and kayaking. The most popular forms are walking and cycling.

The literature shows that active transportation can benefit participants in a multitude of ways including physically, emotionally, socially, intellectually, and spiritually (Jones, 2007; Olgivie et al. 2006; Campbell et al, 2004; CDC, 2003). However, when AT is forced to share travelways with motorized traffic, without adequate infrastructure modifications, there is a large health and economic burden. This is especially evident in developing countries where citizens have little choice in travel modality (WHO, 2004).

A study led by Ming Wen in Australia investigated associations between modes of transportation to the workplace and trends in obesity (2007). This study used a sample

of 6,810 workforce respondents and found that men who cycled to work were significantly less likely to be obese (39.8%) compared with those who drove to work (60.8%). They also found that the use of public transportation was also correlated with lower rates of obesity in men. Surprisingly, this study found no similar correlations in women and no reasonable explanation exists. Not surprisingly, evidence elsewhere indicates that women benefit from regular physical activity. For example, a study led by Nichols (2007) investigated the benefits of sport and physical activity among a sample of young women. This study supports the notion that regular physical activity decreases the risk of heart disease and diabetes as well as can improve self-esteem and body image. This study further indicates that cycling increases bone density although not as much as higher impact sports. Here, it is important to note that low bone density increases the risk for osteoporosis which in turn presents a higher risk of bone fractures later in life.

An article by Mason (2000) further supports the notion that alternate forms of transportation such as walking and cycling as well as using public transportation helps to decrease the risk of cardiovascular disease, diabetes, depression and osteoporosis as long as the active component occurs for at least 30 minutes a day and is conducted at a brisk (light-moderate) intensity. An article released by the Centers for Disease Control and Prevention (CDC) in the United States investigated modes of transportation for children traveling to school. This emphasizes the importance of regular physical activity for children as it develops patterns of behavior likely carried on later in life. It also indicated that children who walked or rode their bicycle to school were less likely to be overweight or obese. Land use patterns also play an important role in active transportation as was highlighted in the Georgia Asthma Survey conducted in 2000 (Bricker et al., 2001). Analysis showed that children who live within one mile of school will walk for the majority of days of the week. These findings suggest how the built environment and proximity to key infrastructure contribute to positive health promotion behavior, especially in early life.

It is important for all people regardless of socio-demographic status to have access to safe transportation routes where active transportation is also a viable alternative. A study led by Butler (2007) analyzed cross-sectional data of 127,610 subjects from the Canadian Community Health Survey. Results indicated that age and income were associated with both walking and cycling as was the geographic location. These results revealed that the most frequent AT participants were young individuals who had well established physical activity patterns. While it is hypothesized that creating safer routes will encourage the elderly to adopt and maintain regular physical activity, some studies suggest that fear is a significant predictor of cessation (see for example, Ravenscroft, 2000). It is surmised therefore, that some elderly individuals are dissuaded from using active transportation because of exposure to increasingly dangerous transportation routes.

ATV user groups, the ATV industry, and HPP make substantial claims about ATVing being part of a healthy, active lifestyle without supporting data. Interestingly, a study is presently underway at York University in Toronto, Ontario. Unfortunately, health claims are already being made by the ATV community about the study's results--even before the study is completed and recognizing that the pilot study was on motocross motorbikes that attained sub-aerobic results (see NSAHF brochure). In contrast the healthcare dividends of active travel are supported by an expanding body of evidence in scientific publications such as the Journal of Epidemiology and Community Health and

the journal: Preventing Chronic Disease. Cycling and walking are increasingly recognised in the medical profession as the most convenient and cost effective ways to get exercise and maintain health. According to the Surgeon General of the USA, "people who participate in regular physical activity reap substantial health benefits." The most significant are:

- Lower mortality rates for both older and younger adults. Even moderate increases in exercise are helpful;
- Lower risk for heart disease and stroke;
- Prevention or delay of the onset of high blood pressure and actual lowering of blood pressure among people with hypertension;
- Decreased risk for non-insulin-dependent diabetes;
- Weight loss and redistribution of body fat; increase in muscle mass;
- Relief of the symptoms of depression and anxiety and improvement of mood: and apparent improvement of health-related quality of life by enhancing psychological well-being and by improving physical functioning among people with poor health." (Jackson & Kochtitzky, n.d.)

These active transportation benefits are reinforced by Lawlor and associates (2003).

> Regular participation in moderately intense activity, such as brisk walking and cycling, is associated with health benefits. Activities that can become part of everyday life, such as walking or cycling to work or school are more likely to be sustained than activities that require attendance at specific venues. Therefore, walking and cycling offer an effective means of increasing population levels of physical activity and improving health.

The evidence supporting active travel is expected to translate into substantial healthcare dividends. Campbell (2004) estimates for example, the financial benefits of active travel to the Canadian economy at $3.5 billion annually. This estimate not only represents the direct savings from a more active and consequently healthier than otherwise expected population, it also represents the less direct dividends from reduction in greenhouse gas emissions, traffic congestion, ground level air pollution, noise pollution, increased public safety, and the advantages of community connectivity and increased mobility for otherwise marginalised members of society such as the disabled, the young and the aged. Fortunately, some of Nova Scotia's relevant healthcare costs and projected savings from a more active population can be estimated from Colman's (2002) study entitled *The Costs of Chronic Disease in Nova Scotia*. According to Colman, the healthcare costs of inactivity are staggering. The annual costs are estimated to be $66.5 million in Nova Scotia. When this is combined with productivity loss due to premature death and disability, this adds a further $247 million. This amounts to $354 million per year for Nova Scotia which represents an extra $629 average annual cost for each inactive Nova Scotian. Every year there are 2,224 Potential Years of Life Lost (PYLL) to inactivity. Colman describes this estimate, based on 2001 data, as conservative; present costs are expected to be substantially higher.

Basic economic analysis makes the case then for promoting increased activity and encouraging those with inactive lifestyles; that is those who do not meet basic guidelines for weekly physical activity to become more engaged. It is increasingly well documented that Active Transportation infrastructure increases physical activity among the general population. With active travel infrastructure improvements such as those for bicycle commuting, participation increased 270% in Toronto, 50% in Copenhagen, 75% in

Eugene, Oregon, and 225% in Vancouver (Campbell et al, 2004). The evidence suggests that active transportation infrastructure pays for itself in healthcare costs savings alone which means that carbon emission mitigation, recreation, tourism and community development benefits can be seen as a bonus for infrastructure investment. Campbell reports yearly returns on investments for trails in Ontario, Quebec, and Alberta as 480%, 108%, and 104% respectively.

On the other side of the ledger there are costs incurred in active transportation. For instance, bicycling accidents contribute to healthcare costs and must be weighed against cycling's healthcare dividends. An article by Schwartz and Brison (1994) suggest that bicycle injuries are prevalent among children and that fatal injuries are often related to the use of unfamiliar bicycles and/or non-helmet use. They recommend that "children be encouraged to buy a helmet when purchasing a bicycle, that both should be properly fitted, and that children be enrolled in safety courses". Of particular note is that the World Health Organization (WHO, 2004) cites a pandemic in injuries and deaths resulting from collisions of cyclists and pedestrians with motor vehicles and recommends wherever feasible, to separate AT modalities from motorized vehicles. Voluntary Planning in relation to ATVs states:

> Safety is an issue that affects many Nova Scotians, not just those operating off-highway vehicles. It matters immensely to the medical community that treats the injuries and to the families and communities that must deal with death or serious injury caused by the use of off-highway vehicles. (Voluntary Planning, 2004 p.6)

There are numerous epidemiological studies conducted over the last thirty years that have documented the frequent and serious injury and deaths resulting from snowmobiling and ATV use, particularly among children. We have counted over 150 substantive studies. Widespread ATV recreational use began in the early 1970s and injury rates in children and adolescents during this early period were substantial (Kirkpatrick, 2007). Despite widespread publicity and the eventual withdraw of three wheeled ATVs from the marketplace in 1988 which were particularly dangerous, the Consumer Products Safety Commission 2002 annual report (2003) revealed that 5,239 deaths in the USA were attributed to ATVs between 1982 and 2002. Significantly one third of these deaths involved children younger than 16 years.

Interestingly, a news release by the Canadian ATV Association (CATVA) claimed that riding a bicycle was more dangerous than driving an ATV. The National Electronic Injury Surveillance System (NEISI) was quoted as the data source in a study released by the Consumer Product Safety Commission in the fall of 2002. We were unable to locate the original information sources. Be that as it may, it is indeed true that more cyclists are injured on bicycles but it is false to say that ATVs are safer. This statistic simply recognizes that there are many more cyclists than ATVers and if the risk was the same for cycling as it is for ATVs, we would expect substantially more cycling injuries and the morbidity and mortality rates would be astronomical (see Brown, 2002 for a comparison of injury types). In a news brief appearing in the April 29, 2003 issue of the Canadian Medical Association Journal quoting statistics from the *2003 National Trauma Registry Report Hospital Injury Admissions* in Canada, the number of ATV trauma admissions rose by 50% over 1996/7 admissions. While New Brunswick experienced the largest increase, Alberta and Nova Scotia followed with Quebec registering the largest number of incidents. It is clear that while ATV participants

represent but a small fraction of the Canadian population, they represent 1.3% of all trauma hospitalizations. That means that for every 100 patients passing through an emergency room door, on average one will be the result of an ATV trauma incident. See the American Academy of Orthopedic Surgeons – Orthopedic Trauma Association (AAOS - OTA, n.d.) advertisement for a particularly poignant reminder of the dangers of ATVing (see Figure 3).

Studies led by Kirkpatrick reported that ATV trauma continues to be a prominent source of morbidity and mortality among children (see also Curran and O'Leary, 2008; Kirkpatrick et al, 2007; Kute et al., 2007; Helmkamp, 2007; Wang et al., 2007; Alawi et al. 2006 and Prigozen, 2006 as examples). They note that helmet and other legislation alone has failed to curtail these incidents and that increased educational programs may be beneficial in lowering child and adolescent injury and death rates. Related studies led by Wang (2007) support the notion that child ATV injuries are a significant contributor to healthcare costs, they also note that the number of reported incidents is steadily increasing, and that passengers are particularly vulnerable. They further report that the average age of children admitted to hospital resulting from ATV incidents was about 12 years of age for drivers and 10.5 years for passengers, and of this group seventy-six percent of children were not wearing helmets. Furthermore, they reported that the average hospital stay was 6 days, with 81% of cases discharged to their homes and the remaining 19% either died or were sent to rehabilitation programs.

A study by Sibley and Tallon (2002) considered ATV injuries over a five year period in Nova Scotia, Canada and noted that young male adults as well as youth are particularly vulnerable to injury. The results from hospital discharge records indicated that the vast majority of patients were male (92%), and 64% were between 16 and 34 years of age. The average ISS (Injury Severity Score [ISS] $\geq$12) was 22.1 (see http://www.trauma.org/archive/scores/iss.html), and injuries to the central nervous system comprised 39% of all major injuries. Alcohol was involved in 56% of all incidents, and only four patients (16%) were known to be wearing a helmet at the time of injury. One indicator of healthcare costs is that the average hospital length of stay (LOS) reported was reported to be 21.6 days (see also Balthrop, 2007). There are numerous other epidemiological studies identifying the health burden of ATVs and snowmobiles (see for example: Centers for Disease Control and Prevention, 2006; Mullins et al, 2006; NLPHA/ARNNL/NLMA, 2004: Rodgers, G.B. & Adler, P., 2001). It is important to note, given the healthy living claims of the ATV community that not all injuries and healthcare costs associated with ATVs are due to collisions and trauma. A study led by Rehn et al (2005) for example, investigated whole body vibration (WBV) and the resulting effects on the spine and neck. Rehn noted that in general WBV contributed significantly to lower back and neck pain and was rated in the *high caution zone* of the European Union health guidance classification system.

Over the river and through the woods to the trauma center we go.

All-terrain vehicles can go 60 mph and weigh 600 pounds. Yet, many owners think of them as just big toys. Consider the facts: 136,000 ATV-related injuries were treated in hospitals and doctors' offices in 2004. Accidents happen when ATVs are operated in the wrong place, under the wrong conditions, by people too young or too inexperienced in ATV safety measures. If you must ride an ATV, use your head — the right way. A public service message from the American Academy of Orthopaedic Surgeons and the Orthopaedic Trauma Association.

For recommendations on ATV safety, visit **orthoinfo.org** and **ota.org**.

AAOS
American Academy of Orthopaedic Surgeons

OTA
Orthopaedic Trauma Association

Figure 3: AAOS – OTA Advertisement.

The Environmental Costs and Benefits

Today's built environment and urban planning in North America has been designed primarily to support automobiles rather than people (Frank et al, 2005; Tapia, 1998). This is broadly true in developed countries where the automobile remains the safest, most convenient form of transportation. Despite these benefits, considering automobile greenhouse gas emissions at dangerously high levels and the emerging health costs associated with sedentary living, there is an increasing need for alternative transportation. An article by Tapia (1998) discusses the epidemic of increasing use of motorized vehicles in the nineties and the decreasing safe accessibility for AT. While Tapia stressed that CO_2 emission impacts may be catastrophic in the not too distant future, he also noted the persistent growth of automobile infrastructure was among the leading causes of environmental degradation. Unlike private automobiles, public transportation, bicycling, and walking help reduce emissions rate per passenger-kilometre travelled and also reduce traffic congestion, traffic volume and the morbidity and mortality associated with pollution (Bicycling and Walking Study, 1993). Tapia argued for health policy that promotes alternate forms of transportation as they not only encourage physical activity that has health dividends but also reduce greenhouse gas emissions.

Further issues of concern are whether new trails will promote physical activity or simply provide another option for the already committed. Importantly the question is whether trails will contribute to lowering health care costs and encourage sedentary individuals to adopt a more physically active lifestyle. An important consideration is then whether the provision of active pathways will actually encourage automobile substitution with non-polluting forms such as walking and biking. A further issue is whether the environmental costs of trail construction are outweighed by the environmental benefits over the trails lifetime. Librett (2006) investigated a national sample of 3,717 adults in the USA (2006) to determine how physical activity patterns and socio-demographics related to trail use. The results showed that almost 13% of the sample reported using trails at least once a week and 24.3% at least once a month. Those using the trails at least once a week were twice as likely to meet physical activity recommendations. From a political perspective, nearly half (43.6%) of the non-trail users supported expanded public spaces for people to exercise. Notably, 36.4% of the non-trail users reported that they would be willing to pay more taxes to build more parks and trails in their community. These findings suggest that these community trails promoted physical activity among previously active individuals but offered little evidence that they actually coax newcomers to become more active. From a community development perspective; however, nearly half of frequent trail users reported that access to trails and other green space was an important factor when choosing a place to live.

To address the issue of previously inactive residents, a related study led by Gordon (2004) compared trail use among new and habitual exercisers. A cross-sectional analysis of 414 adults was conducted and the results showed that 23% of present trail users were new exercisers. It is important to note that newcomers were more dependent on the trails as a primary outlet for physical activity than those who were habitually active exercisers. It is also noteworthy that new exercisers traveled shorter distances to access the trails and rated their convenience as a primary benefit. Both safety and terrain

issues emerged as enablers for trail use, and unsafe conditions emerged as a concern among new exercisers. These results suggest that community trails can effectively promote physical activity in new as well as habitual users; however, new users must overcome a series of environmental and psychological barriers including safety issues before adopting more active lifestyles.

These results bode well for investments in active transportation trail systems. Often trails are constructed using preexisting infrastructure such as railroads; however, sometimes they must be built from scratch. A proposed trail implementation guide from the San Diego County Department of Planning and Land Use (n.d.) discusses some benefits of maintained trail use. For San Diego paving a trail is considered an upgrade that provides several key benefits particularly for those using wheelchairs. While providing access to a broader variety of users, a paved trail reduces the risk of rocks, roots or potholes, better traction for runners and bicyclers, and an increased likelihood of winter use as asphalt reflects heat and reduces snow build-up. In addition, paved trails leave open the opportunity to plow a trail.

In considering environmental costs, it is also important to assess construction and maintenance costs of active transportation pathways, and contrast these with their benefits. A study by Wang and associates (2004) estimated the annual cost of five bike and pedestrian trails in Lincoln, Nebraska. The annual cost per user was assessed at US$235 (range = $83-$592). Given these costs Wang suggests trail use can be a practical health promotion amenity but additional promotional efforts are required to increase usage that will reduce per user costs.

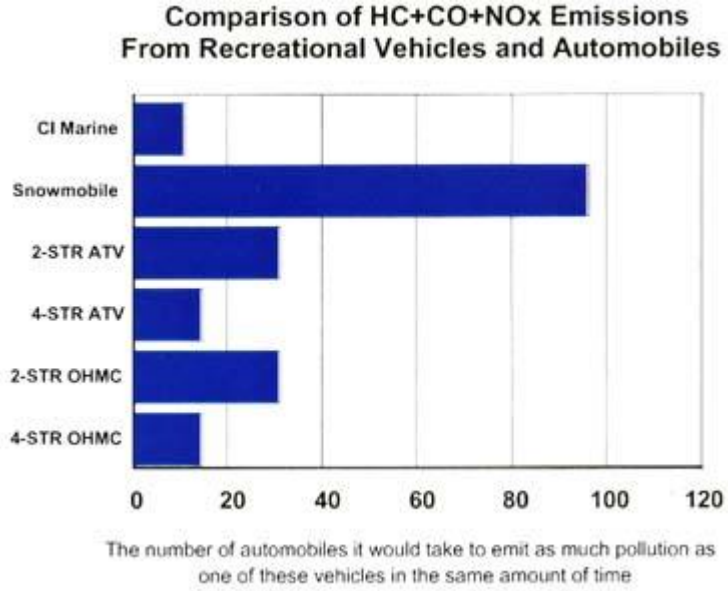
Although claims are made within the ATV community that ATVing leads to greater environmental appreciation (see the NSAHF brochure), no research articles are available to support this. In contrast, Voluntary Planning stated:

> We believe it imperative to protect various kinds of land, habitat, and wildlife from the damage caused by off-highway vehicles, including protected Wilderness Areas, municipal water supply areas, and ecologically sensitive areas in general. Most of our province is privately owned, and the imposition of off-highway vehicle operators on the rights of these landowners is not acceptable to our society. (Voluntary Planning, 2004 p.6.)

In the early seventies the Yale Law Journal reported on the heavy environmental burden of a largely unregulated arena for snowmobile use (author unknown, 1973), this article indicated that “the present system of legislation, administrative regulation, and enforcement is inadequate to handle the burgeoning snowmobile phenomenon” (p.778). Some regulators reported that the shortcomings of the existing legislative “framework lies not in the regulatory scheme itself but in the lack of resources to compel compliance” (p.788) while others laid the blame on the legislation itself. Similarly today, many non-technology based users complain that ATV users, a mode of recreational transportation that has mushroomed since the early seventies, damage trails as well as interfere with wildlife. Studies by Ahlstrand and Racinet (1993) provided evidence that several forms of recreational vehicles cause significant damage to recreation trails and scenery. As a more current paper to the Yale article, they focused on ATVs. It is suggested that trail damage caused by ATVs can be dangerous to lower technology users such as hikers and cyclists.

Recreational use of ATVs has also been shown to be a significant contributor in vehicle emissions and consequently air pollution. Emission regulations set in 2002 for ATVs and meant to come into effect in the USA in 2006 (EPA, 2002) was delayed to begin in 2014 (EPA, 2007). These regulations will only apply to newly manufactured vehicles (EPA, 2002). Significantly, ATV models previous to this year have been shown to emit about 130,000 tons of hydrocarbons (HC), 550,000 tons of carbon monoxide (CO), and 4000 tons of oxides of nitrogen (NOx) annually in the United States (EPA, 2002). In the absence of a similar Canadian data, it can only be assumed that comparable findings are found in Canada. In an effort to examine pollution, the EPA measured emissions from ATVs and snowmobiles. As emission characteristics vary depending on engine category, both two and four-stroke engines were assessed. Table 1 shows the comparison in emissions of various non-road recreational vehicle emissions with ordinary cars. Amazingly one hour of snowmobile operation is equivalent to nearly 100 hours of automobile use while a two-stroke ATV is equivalent to over thirty hours of car driving. While we might expect somewhat better emissions nowadays from recreational vehicles, we can expect similar improvements in cars.

Table 1: ATV Emission Rates



New internal combustion engine emission regulations for automobiles have been prescribed in the Canada Clean Air Act (Bill C-30, 2006) but it is unclear whether this bill will be ratified or whether it or a similar bill will be extended to recreation vehicles. Importantly, the proposed emission regulations in the USA do not give specific direction to ATV manufacturers on how to improve the vehicle emissions; it is anticipated nevertheless, that most manufacturers will replace two-stroke engines with four-stroke engines. While the four-stroke engine is more expensive, it uses about 25% less fuel and oil than an equivalent two-stroke engine. Adding air to the exhaust stream or optimizing the air-fuel mixture is also anticipated to reduce emissions; in addition some manufacturers may also develop fuel-injection systems or add catalytic converters to control emissions. Regulations have also been introduced to control permeation

emissions from ATV fuel systems which are also expected to reduce the strong smell of the gasoline emitted by ATVs. Another concern is noise. The EPA notes that manufacturers presently make ATVs that meet current noise standards and there are no plans for higher standards. Noise is; however, likely to interfere with other trail users and adjacent landowners, and as a consequence municipal governments will need to establish noise regulations. Significantly, the World Health Organization (WHO) reports that:

> The recognition of the noise as a serious health hazard as opposed to a nuisance is a recent development and the health effects of the hazardous noise exposure are now considered to be an increasingly important public health problem. (WHO, 2001).

While trail travel limits and concentrates environmental damage; ATVing off trail is particularly destructive and widespread. The most authoritative overview of the damage to landscape and wildlife in North America (focusing on the USA) is a pictorial compilation of essays entitled *Thrillcraft: the environmental consequences of motorized recreation* edited by Wuerthner (2007). It begins with a discussion of our generation's estrangement from nature and its entanglement with corporate America and then examines the expropriation of the wild for private interests as well as the misuse of economics to distort and exaggerate public benefits associated with motorized recreation. It then catalogues the landscape damage done throughout America from Alaska to the south-western desert states and also discusses the challenges of turning private behaviour and public policy around.

The Economics of ATVs and Active Travel

> The motorized recreation industry and use groups seek maximum access to the public domain with minimal restrictions on their activities. That industry has often tried to use economic analysis to demonstrate the social rationality of leaving motorized recreation largely unregulated. These analyses, however, are based on a peculiar economic alchemy that seeks to transform private interests and public costs into public benefits.
>
> Thomas Michael Power, PhD.

In terms of gross economic activity a case can be made that the annual ATV expenditures on a per-user and total sales basis exceeds that of expenditures for active transportation. It is; however, difficult to obtain comparable sales figures for ATVs and bicycles in Canada as the respective industries report statistics quite differently. Unfortunately, Statistics Canada figures are not useful as its reporting categories are too broad. Using industry data, it appears that the sale of ATVs at an average selling price of about $8,000 amounted to approximately $711 million in gross sales (COVC - CVHR, 2007). As only one of the five major manufacturers is Canadian and none are built in Nova Scotia, this means that wholesale and transportation charges are lost from Provincial coffers. In comparison 1,549,834 bicycles were sold in Canada in 2004, of which thirty percent were assembled in Canada at an average sale price of $200. Gross retail sales in Canada amounted to approximately $310 million (CITT, 2006; see also Lemieux, 2005). Again there are no manufacturers or major wholesale outfits in Nova Scotia that distribute bicycles so it can be expected that there is substantial economic leakage. From a political and representational perspective, it should be noted; however, that the number of bicycles sold, extrapolated to Nova Scotia, exceed ATV sales by a factor of nine to one.

The 1973 Yale Law Journal article referred to earlier concerning the environmental impacts of snowmobiles also considered economic impacts. It suggested that the economic benefit claims of this industry were grossly overstated. From an economic welfare standpoint, the system that supports snowmobiling

> fails to insure that the [environmental and social] costs of snowmobiling are paid by those who cause them … in effect [it] receives a subsidy from those to whom it causes damage. It consumes great quantities of scarce goods like quietness, natural resources, and recreational opportunities. The resulting costs are paid mainly by non-snowmobilers—whether they be competing recreational users or the public at large by way of government subsidy. Hence snowmobiling costs are predominantly subsidized (p. 779).

This argument, which can be applied to ATVing today, is that snowmobiling is cheaper that it might otherwise be if the activity were fully charged for the environmental damage, its health cost burden, and for its inconvenience to others. As a result, the Yale article argues that there is a misallocation of resources to snowmobiling while other outdoor recreation activities become less desirable or are displaced. While the Yale analysis is useful, it fails to account for the medical costs of ATVing. In this regard a fact sheet published by the Children's Safety Council in the USA (2005) estimated the costs of non-fatal ATV caused injuries in youth under 17 years, based on medical expenditures, work lost, and loss of quality of life, to be $1.4 billion. Of this, the direct costs of hospital admissions were $5.2 million.

When designing trail use policy it is important that communities examine the full economic costs and benefits with respects to all users. So "from an economic perspective, building recreational infrastructure such as trails is considered a welfare enhancing investment if the benefits generated from the built infrastructure exceed the cost of doing so" (Janmaat and vanBlarcom, in press). Janmaat and vanBlarcom conducted their study to examine the value of a proposed trail in the Annapolis Valley, Nova Scotia under various use conditions. A contingent trip survey method was used to examine relative trail use trends between motorized and non-motorized users. Results revealed that a trail "between Grand-Pre and Kentville in Nova Scotia's Annapolis Valley can be expected to generate between $0.883 and $4.067 million [Canadian] per year in gross benefit to trail users". This analysis does not include any benefits gained from traffic reduction, if the trail is used for commuting purposes; nor does it consider the benefits of reduced conflict between motorized and non-motorized users if non-motorized users are diverted away from public highways. Their study also ignores the possible health benefits that result from increased physical activity by active transportation trail users. A follow-up analysis of these costs is underway (pers.com. Brian vanBlarcom).

Janmaat and vanBlarcom suggest that trail installation can increase physical activity; they note findings elsewhere showing 70% of trail users self-reported an increase in benefits from physical activity. In another study no significant additional physical activity benefits were found from a new trail; however, this community was already well endowed with safe, accessible sidewalks and trails indicating that marginal gains were smaller than might be expected when a unique asset is added to the transportation mix. Interestingly, for the Annapolis Valley proposed trail, there was a lower than expected response rate from ATV users (n=10%) indicating either that there is a substantially smaller ATV population than potential non-motorized users or that ATV users have little interest in this trail's potential. Janmaat and vanBlarcom's data revealed

that if ATV use is permitted on this trail, non-motorized users' number of trips will decrease 44% which reduces the consumer surplus by nearly 37%. This estimate reflects that consumers are actually willing to pay more than expected costs but also that ATV use would deter non-motorized users for fear of injury and disruption of the non-motorized experience, which would diminish the value of the trail. In addition ATVs create an additional cost for trail maintenance. Fortunately for AT advocates, for this particular trail which is a rail and trail proposal, the railway owners have no interest in allowing motorized access as there are substantial risk management implications.

Janmaat and vanBlarcom note that the consumer surplus of trail use is expected to be C$9.19 with ATV access, and C$26.89 per trip without it. It is important to consider in this regard that if non-motorized users avoid the trail; their lack of participation might be misconstrued as lack of interest when in fact they are permanently displaced. These researchers conclude that failure to construct this trail is expected to result in a loss of $800,000 worth of benefits to users each year. While this figure is substantial, it does not include the expected environmental benefits that will accrue to both users and non-users, and the direct health benefits to users that will also benefit tax-payers.

The ATV community claims that recreational ATV use promotes tourism and positively impacts the provincial economy. According to a recent study in Minnesota, the state benefits from recreational ATV use by $641.9 million annually (ATV Minnesota, 2004). A key difference between Nova Scotia and Minnesota is that there are two major ATV manufactures in Minnesota employing over 5,000 workers. Unlike Nova Scotia, much of the gross expenditure that would leak from Nova Scotia re-circulates in Minnesota. The Minnesota study nevertheless, says nothing about environmental and health costs. Given this frequent oversight in special interest economic impact statements, (see: Power, 2007; Crompton, 2006), other academics are skeptical about the net benefits of ATVing. They suggest that with increasing ATV use there is increased air pollution, wildlife damage and healthcare costs that are not adequately considered (Ahlstrand, 1993, Kock et al, 2003; Wang, 2007; and Power, 2007). As suggested by Koontz (2004) and Janmaat and vanBlarcom (in press), many non-technology based recreational users are likely to be displaced by ATV use and this represents a loss of value from AT residents and tourists. In contrast, studies from Quebec indicate that cyclotourists spend considerably more than average tourists. An average cycling tourist spends over $100 per day ($105 for a cycling tourist on holiday and $112 for a sporting cycling tourist). As a comparison, the typical tourist from Quebec spends on average $57 per overnight" (Barry, 2003). From a public policy perspective it is important to note that Quebec's Route Vert is managed directly by its department of transportation; this is touted by the province's active transportation lobby as a key success factor (http://www.routeverte.com/rv/).

In a study of *The Impact of Spending by ATV/Trailbike Parties on New Hampshire's Economy* during July 2002 to June 2003" commissioned by the Granite State [New Hampshire] All Terrain Vehicle Association (Okrant and Goss, 2004), it is reported that a total of $124 million in direct expenditures is generated within the state and indirect spending amounts to $176 million. This was estimated to be 0.29% of the gross state product (GSP) and 2.3% of all travelers' spending. Perhaps the most interesting finding is that the average ATV/trailbikers travel parties' spending was substantially less than the average for all travel parties. The expenditure was $60.12 for

instate travelers and $46.40 for out of state ATV / trailbikers which compares to $70.32 for all travel parties within the state. What was not reported is perhaps more important. No mention was made for example, of the environmental, health or opportunity costs to the state with ATV promotion. One cost indicator is that an economic multiplier of 1.42 is applied to direct expenditures of ATVers compared to 1.47 for average travelers. This suggests that if infrastructure expenditures were applied to more lucrative tourism products, the state might reasonably expect greater returns. Given the costs of ATV associated healthcare and environmental costs, the overall balance sheet should be skewed negatively and when capital leakages related to ATV sales are added, the overall picture is dismal.

The Social Benefits of ATVs and Active Travel

Recreational trails provide an opportunity for a wide array of social benefits. They provide a corridor for physically active lifestyles that promote socialization and frequently offer convenient access to community amenities. The British Columbia government's trails strategy stresses; for example, the benefits of safe and accessible recreational trail systems that provide opportunities for families to recreate together as well as be physically active (British Columbia Ministry of Tourism, Sport and the Arts, 2007). This policy also suggests that recreational trails allow opportunities for those in wheelchairs to become more physically and socially engaged. By focusing on the benefits of AT, a recent study led by de Geus (2007) investigated the psychosocial and environmental aspects of bicycling. The results showed that those with adequate access to bicycling infrastructure are more likely to overcome other environmental barriers such as inclement weather to increase usage. No peer reviewed research is available specifically on the social benefits of ATV use. There is; nevertheless, substantial anecdotal evidence that they accrue among participants. There are, for example, numerous ATV clubs and organizations that attest to a social dimension. The Haliburton ATV Association in Ontario for example, promotes social opportunities and promotes conduct that increases the likelihood of a safe, enjoyable experience that respects other trail users (http://www.haliburtonatv.com/). While BC's recreational trail strategy suggests that both motorized and non-motorized users can reap a wide array of benefits, it makes clear that few trails are managed for ATV use (Ministry of Tourism, 2007).

No authoritative account of ATVs' social costs has been completed in Nova Scotia; there are nevertheless, key considerations. Koontz' framework clearly points to the asymmetrical impact of higher technology modes on walking and biking. Among the impacts suggested by Janmaat and vanBlarcom, high levels of displacement can be expected when ATVs and snowmobiles share trails with physically active users. While Janmaat and vanBlarcom's study examined possible rather than actual use of a proposed trail, this stresses the fact that a study of displacement is problematic as on-site observations are unable to capture those already displaced. Anecdotal and systematic observation of lower technology use on shared use trails has been repeatedly argued by HPP personnel as proof that "shared use" works (Ted Scrutton, 2006); however, such observations fail to account for walkers or cyclists already displaced as Ravenscroft (2000) and Gardner Pinfold (1999) have documented. Beyond displacement, The *Final Report of the Voluntary Planning Off-highway Vehicle Task Force* in Nova Scotia

(Voluntary Planning, 2004) recognized that in addition to the potential for substantial environmental damage, there was also the potential for considerable social discord with the proliferation of ATVing.

> We are concerned about the physical impact of the current numbers of machines. Over the previous four years, an average of 4,600 new all-terrain vehicles have been sold in Nova Scotia each year. Should this rate of sales continue, or increase, the potential for social discord and environmental damage may grow accordingly. (Voluntary Planning, 2004 p.24)

In addition to trail concerns with the proliferation of ATVs in Nova Scotia, there is recent evidence that suggests that several local communities throughout Nova Scotia have been badgered by the joint forces of the NS Departments of Natural Resources and Health Promotion and Protection to accept ATVs and snowmobiles on local trails, against their expressed will, despite the clear directive in the Rails to Trails policy to promote good neighbour relations. Government support has clearly empowered the ATV lobby to press for trail access even where this is clearly inappropriate and in fact legally banned such as within the Grand Pre to Kentville active rail corridor and the Highway 351 right-of-way. When invited by the Kings County Council to give an update on efforts to develop an active transportation pathway in these corridors in December, 2006, the Kieran Pathways Society (KPS) was heckled by members of a seventy strong ATV lobby group. Importantly the railway company has shown no interest in supporting motorized recreation vehicle access because of liability and the greater potential for damage.

There are social costs resulting from the high toll of morbidity and death due to ATV related trauma. With one exception (see below Ravenscroft, 2000)), we were unable to identify any studies directly attributing social costs to active transportation, except those connected to accidents within public highways (WHO, 2004). There are clearly potential social costs in sharing trails and pathways, even when activities are restricted to active transportation, but the evidence suggests that the benefits substantially outweigh these costs. SUSTRANS (http://www.sustrans.org.uk/), for example, the United Kingdom's sustainable transportation advocate and provider, has thirty years of experience promoting shared, active transportation corridors and have reported relatively few conflicts. Last year, 2007, they estimated 354 million walking and cycling trips on the National Cycle Network.

Ravenscroft (2000) conducted a series of focus groups in the UK with trail users and non-users to examine the intrapersonal and interpersonal constraints and the structural barriers associated with the use and non-use of trail assets. His methodology potentially captured some of those displaced by adverse trail access or trail conditions. His findings are particularly relevant to shared, non-motorized trails in Nova Scotia as thoughtful trail policy manages but does not always fully resolve the inherent conflicts with different active transportation modalities and activity styles (see Jacob and Shreyer, 1981).

> Rather than being able to use specialist facilities, those wishing to participate in off-road … cycling, and [walking or] to some extent jogging, are faced with sharing spaces with a broad range of informal recreationists, all with their own motives for being on the trails. Although their motives may differ, all the users are united in their wish to avoid motorized traffic, and most users accept that compromise is necessary to achieve this (Ravenscroft, 2000, p.41).

Discussion

This purpose of this study was to examine the evidence supporting the Government of Nova Scotia's "shared use" trail policy. We focused on health, environmental, economic and social issues and placed this analysis in the context of the converging trends facing Nova Scotia at the beginning part of the twenty-first century. These include population health, the end of cheap oil, and threatened environmental quality. The Government is seemingly aware of these serious issues that require substantive policy revisions but seem unwilling to face many of them head on. We were particularly concerned with the government's call for environmental, health and economic coordination in its Environment and Economic legislation but its reluctance to address the incongruencies regarding motorized off-highway recreation. Not only are the impacts of climate change and the need for strong mitigation strategies considered imminent (IPCC, 2007), other important developments are also key. Concerns such as the impacts on population health from sedentary living, the impacts of an aging population on social services; the ramifications of peak oil; the burden of traffic congestion, and the threats to our present transportation infrastructure on pedestrian and cycling safety coalesce to create a perplexing policy challenge.

This review established that there is no credible evidence linking ATVing and snowmobiling as agents in solving these issues. Indeed, the facts are overwhelming that they lead to very high rates of morbidity and mortality which create a substantial burden on individuals, families, and society. While a definitive study still needs to be undertaken, there is good reason to doubt that ATVing is a positive economic generator for Nova Scotia. It is important to note, for instance, that while the ATV industry and its community has been a formidable political lobby, there are far fewer ATVers and snowmobilers in the province than cyclists and walkers. Active travelers appear to be a very large but generally silent majority. Despite the evidence against ATVs on health, environmental and economic leakage grounds, there is one last arrow in the ATVers' quiver. It is the contention that tourism dollars have been lost to other regions as a result of strengthened ATV regulations. This argument's sails flutter hopelessly; however, when one considers the potential displacement of active transportation tourism revenue as trails are surrendered to ATVs and snowmobiles. It is clear; however, from the shear mass of epidemiological studies that document the health burden of ATVing and snowmobiling that the social costs must be enormous. While the health costs of active transportation, generally occurring on public highways should not be trivialized, the net population health benefits attributed to AT is well recognized.

Concerning the environmental costs and benefits of AT, there is little to be said about the costs. There are costs to building AT trails which increase with paving; nevertheless, these expenditures are best viewed as investments that result in reduced automobile use, increased healthy activity, and reduced highway AT trauma. The same cannot be said about ATVing and snowmobiling. Imagine the impacts, if we experienced the same level of up-take in ATVing and snowmobiling as occurs with active transportation! Substituting motorized with non-motorized vehicles whether for utilitarian or recreational purposes is a win-win situation for the economy, the environment, and with proper infrastructure provision, AT reduces healthcare costs (Frank et al., 2004).

It also substantially reduces commuting costs for those substituting cars for walking, biking and public transportation. Most importantly the capital expenditure on active transportation trails is said to be self-financing over a very short amortization period; and as the US Surgeon General attests, it is likely to be the best value for investment in health promotion. The social capital developed with AT is also well documented; major gains are possible in providing safe routes for children to school, recreation centres and other services with appropriate infrastructure investment. Development of safe, motorized vehicle free, trail networks has major advantages at both ends of the life cycle. With an aging Nova Scotia population, seniors will increasingly benefit from physical activity while also maintaining a higher level of independence. Most significantly, paved, safe and accessible trails afford many individuals with disabilities the opportunity to explore pathways without the encumbrance of motor traffic (Ravenscroft, 2000 & 2002).

Conclusions

Given the overwhelming evidence of the health and environmental costs of recreational ATVing and snowmobiling and their dubious economic and social benefits, there seems little justification for the Nova Scotia's government's ATV and snowmobile promotion strategy. Particularly onerous is the government's policy insistence that they promote healthy, active lifestyles. Any justifiable policy involvement should be directed to restraining their use on health promotion and protection grounds. HPP's policy serves to legitimize ATVs and snowmobiles as a health promotion modality which is misleading. Given the state of the global, Canadian, Provincial and local environment, there appears to be no grounds to promote ATVing as an environmentally friendly activity, or a means to appreciating the environment given their net environmental costs. The means to gain access to pristine areas greatly outweigh any pro-environmental behaviour that might occur in the broader recreation setting. Because shared use of trails with motorized recreation modalities deters active transportation users, the health and environmental benefits forgone by AT users substantially outweigh the ATV community's benefits. When ATVing and AT is placed in the context of climate change, it is clear that every effort should be made in public policy to encourage ATVers and snowmobilers toward more healthy, active lifestyles.

The evidence is that the economic benefits of ATVing are grossly exaggerated and are outweighed by the costs when full cost accounting is used. There is strong evidence that ATVing and snowmobiling have a clear negative impact on the province's economy and quality of life. In contrast, the evidence is sound that Active Transportation's contribution to the economy is very strong, especially when the full value of health and environmental benefits are factored in. Coupled with the equivocal evidence concerning social benefits associated with ATVing and snowmobiling, and the strong evidence supporting AT, there is clear justification for the Nova Scotia government to abandon its present policy stance in support of ATVs and snowmobiling, and transfer its energy and resources to promoting AT.

As the reputation of HPP is now sullied and given the Quebec experience, an important step in rectifying its policy is to take the responsibility for AT infrastructure

development out of HPP and place this firmly with Transportation. With this transfer of responsibility a clear and strong mandate must be given to the Department of Transportation and Infrastructure Renewal to develop a provincial transportation policy and plan that advances AT as a legitimate transportation alternative, as a health promotion and protection strategy (in cooperation with HPP), as an important climate change mitigation strategy, as an important way to stimulate community development, and as a key strategy in developing environmentally friendly tourist products that can keep Nova Scotians closer to home as well as attract visitors.

Closing Comments

In closing we return to the questions raised by the all-terrain Recreation Vehicles Users and Dealers of Nova Scotia (RVUDNS). Concerning the first assertion that tourism money is lost to other provinces, we found little or no evidence to support this. On the contrary, our study suggests that increased ATV restrictions are more likely to have a positive impact on Nova Scotia's economy. As suggested earlier, we do; however, recommend that an independent and full cost-benefit analysis (or economic impact study) be done that unequivocally incorporates health and environmental costs and benefits. Ironically, we cannot disagree with the second statement. We very much believe that it is important for families to get out and enjoy a healthy lifestyle. We do; however, strongly disagree with the suggestion that ATVing and snowmobiling contributes to a healthy lifestyle. The evidence is overwhelmingly to the contrary. There is ample evidence, including an authoritative Nova Scotia study that documents the health costs of ATVing that leads us to wonder why the Government has dithered so long on this issue. Given the public furor over the funding of the youth ATV training scheme (Chronicle Herald, June 19, 2008), the government now has the opportunity to distance itself from its old policy and begin a concerted campaign against ATVing and snowmobiling, much as it has successfully done with smoking. It should also take this opportunity to vigorously support active transportation by making AT, an integral part of its transportation policy.

In regards to the third statement: "We don't agree with restrictions on trails and roads that we have used for decades", it is unclear, given the weight of evidence presented in the Final Report of Voluntary Planning Off-highway Vehicle Task Force (2004), why the government did not act earlier to impose tighter restrictions on ATVs. The imposition of ATVing and snowmobiling on private landowners was very clear. We have little to say about the statement concerning ATV dealers closing their doors and workers going west except that some dealers may well have halted business during this transitional period and some might have been due to new ATV restrictions. We challenge the industry; however, to provide convincing evidence that this legislation was the primary cause and those thirty-eight workers moved west as a result to find work.

We have a mixed response to the final statement, "we don't agree to make youth ride on closed courses only." Based on similar conclusions drawn from epidemiological studies of ATV injuries conducted widely in North America over the past three decades and quite recently in Nova Scotia, it is now widely recognized that youth are not sufficiently responsible to safely operate ATVs. Based on this evidence we believe that the Government has a duty to ban children completely from using ATVs whether on

closed or open courses. The epidemiology evidence is clear that while ATVs are dangerous in anyone's hands, they are particularly dangerous for children and youth. We are further convinced, based on the evidence, no self-respecting parent, knowing of this evidence, would ever allow their children to drive or ride as a passenger on an ATV. Furthermore, we see such parental behaviour as bordering on criminal negligence, and would, with similarly dangerous activities, surely draw the attention of social services.

Finally, we whole heartedly agree that "children should be able to enjoy nature with their parents". However the evidence on the health and environmental costs of ATVing strongly suggest that there are more appropriate ways to do so.

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