

# Unpacking Aviation Travel Futures: An Application of Causal Layered Analysis<sup>+</sup>

---

Murray May\*

*University of Western Sydney, Australia*

Stuart B. Hill\*\*

*University of Western Sydney, Australia*

*An overview of the issues influencing and driving aviation futures, and a critique of such futures, are provided. Air travel has been predicted to grow substantially in the decades ahead, as reflected in scenarios linked to the globalisation of tourism, and travel theories related to the future mobility of the world population. On the other hand, aviation futures are increasingly contested on ecological, resource and safety grounds. Causal layered analysis (CLA), a layered futures research method, is applied to a range of scenarios to add a depth perspective. We thus aim to provide a more holistic account of aviation/mobility/communications futures and their policy implications.*

**Keywords:** aviation, mobility, tourism, ecological sustainability, causal layered analysis

---

<sup>+</sup> Thanks to Sohail Inayatullah for his encouragement, and discussion of this topic with his postgraduate group at the University of the Sunshine Coast, Queensland, Australia.

\* **Correspondence:** 8 Stanley Street, Hackett, ACT 2602, Australia.

Email: murraym@webone.com.au

\*\***Correspondence:** Foundation Chair of Social Ecology, School of Social Ecology and Lifelong Learning, University of Western Sydney, Locked Bag 1797, Penrith South DC, NSW 1797, Australia.

Email: s.hill@uws.edu.au

*Journal of Futures Studies, August 2002, 7(1):41~66*

41

### *Introduction*

Air travel has grown at an average annual rate of 9% since 1950 and is predicted to grow substantially in the years and decades ahead. Such aviation futures are being increasingly contested on both global and local environmental grounds. On the other hand, the globalisation of tourism and trade is a strong driving force for the substantially increased use of aviation worldwide.

The purpose of this article is to give an overview of the issues influencing and driving aviation futures, and to apply the causal layered analysis (CLA) futures research method (Inayatullah 1998, 2002) to a range of qualitative scenarios, as presented in Table 1 later in this article.

As background for the scenarios, three substantive sections are presented first, namely:

- Current accounts of world aviation futures, and especially their ecological ramifications
- A significant travel theory related to the future mobility of the world population
- The globalisation of tourism, in order to give an economic and political context for aviation futures

In the fourth main section, the causal layered analysis approach is applied to a range of scenarios relevant to aviation futures. Here, the more predictive and interpretive futures approaches used in the first three sections give way to a depth approach which is critically focused, in that it seeks to “undefine” the future. That is, attention to underlying discourses, worldviews, myths, and metaphors not only challenges dominant paradigms, but opens up space for creating alternative futures.

By using these predictive, interpretive and critical futures approaches, and analysing and understanding both quantitative trends as well as qualitative underbellies, we aim to provide a holistic account of aviation/mobility/communications futures and their policy implications.

### *World Aviation Futures - an Ecological Context*

Aviation futures are increasingly contested. The following local example from the United Kingdom is illustrative:

*The site on the Kent marshlands is one of Britain's precious wetland areas, home or stopping off point for hundreds of species of bird, insect and mammal. Yesterday environmentalists, residents and local politicians were aghast at the idea that the government could be looking at this remote spot, famous as a setting for Charles Dickens' Great Expectations, as a possible site for a new airport.*

*The transport secretary, Stephen Byers, is reportedly considering a proposal to build a four-runway airport at Cliffe, near Rochester, as part of expansion plans needed to cope with a projected doubling of air traffic over the next 20 years.*

*...Residents are aghast at the idea that their peace could be ruined by aircraft. Chris McLoughlin, clerk to Cliffe parish council, said: "This is a nice rural area. That's why 70% of people have come to live here." (Morris 2002)*

The UK government has, since December 2000, been conducting a consultation process to help set its policy for air travel for the next 30 years. The process, outlined in the associated consultation document *The Future of Aviation* (Department of the Environment Transport and the Regions 2000), is attempting to grapple with issues associated with the growth of aviation and the fact that the UK's major airports are reaching their capacity limits.

Another side of the debate is represented by the "Freedom to Fly" coalition, representing the aviation industry, business, trade union and tourism groups. The group is lobbying the UK government for increased airport capacity in the lead up to the White Paper ensuing from the consultation process. The group cites an opinion poll that shows that most people supported the case for more capacity at airports "to maintain the freedom to fly and to sustain the economy." As Sir Richard Branson, chairman of Virgin Atlantic summarised the matter: "A no-growth solution is simply unacceptable" (Done 2002).

The range of ecologically contentious issues surrounding the growth of aviation at airports relates to both global impacts, as with the effects of emissions from aircraft on climate change, and also local environmental impacts. The latter include for example, the effects of aircraft noise on people living near airports and under flight paths, and the local air quality effects of emissions from aircraft at airports and in the immediate vicinity.

If one takes a broader focus, the ramifications are far reaching. The above example highlights the impacts of airport development on landscape,

people's quality of life, and animals' natural habitats. Concerns about the end of the "age of oil" raise issues related to the intensive use of a non-renewable resource. Further, the "embodied" greenhouse emissions associated with the increasing production of aircraft and consumer oriented commercial developments located at airports are substantial (Citrinot 1999; Lenzen 1999).

### *Aviation, Climate Change, and Aircraft Noise*

Returning now to two of the earlier mentioned environmental issues, namely climate change and aircraft noise, which are prime concerns of conservative official bodies such as the International Civil Aviation Organization (ICAO) as well as non-government networks of environmental organizations, such as the Green Skies Network <<http://www.greenskies.org>>.

While the climate change issue has significant current and ongoing ecological ramifications at a global level and hence is of crucial importance (IPCC 2001), the continuing growth in aircraft movements also threatens to expand noise sensitive areas around airports, thus heightening public opposition to air transport developments (Skogo 2001).

Air travel has grown almost 100-fold since 1950, at an average annual rate of 9%. This is predicted to continue, with a world fleet of 23,000 aircraft by 2016, twice as many as in 1996 (Brown, Renner & Halweil 1999: 86). Skogo (2001) reports that a specifically designed computer model for assessing exposure to aircraft noise, points to air traffic growth increasing noise contours at larger airports, and also at smaller, regional airports. Hence a major issue for the airline industry in this century is the tension between airport expansion as a result of the deregulation and liberalisation of air transport, and the resultant negative impacts on, and increasing sensitivities of, surrounding communities (Nero & Black 2000).

This was borne out in a well publicised landmark ruling on night flights in 2001 by the European Court of Human Rights in favour of the rights of residents to have a decent night's sleep over the airline industry's wishes. The case was brought by eight people living near Heathrow airport in London. Article 8 of the European Convention on Human Rights guarantees people a right to respect for home and private life. The court ruled that the UK government had not grappled with the issue of prevention of sleep by aircraft noise and there was thus a violation of Article 8 (Buxton 2001).

Particular airports are either adopting or being forced to adopt better practices. For example, in 2001, the German and Swiss governments reached agreement on reducing noise over southern Germany by aircraft using Zurich airport. The resulting agreement extended a weekend night-flight ban to three nights during the week as well, and pressure for curfew arrangements will continue to be applied by community groups working for quality of life outcomes (European Federation for Transport and Environment) (T & E 2001).

In relation to aviation and climate change, a major contribution was the publication in 1999 of the Intergovernmental Panel on Climate Change (IPCC) report *Aviation and the Global Atmosphere* (Penner et al. 1999). The report was written by over 100 experts and was peer reviewed by another 150 experts worldwide. It concluded that aviation contributes less to global warming than many other human activities, but is nevertheless a significant and fast growing percentage of human generated greenhouse gases.

The IPCC report used a range of scenarios to estimate future air passenger travel demand, and the concept of radiative forcing to estimate emission climate changing potential. While the aviation induced proportion of human induced climate change is about 3.5% of the total in 1992, by 2050 this is projected to be up to 7% of the total for the mid-range scenarios, and up to 15% of the total global warming for the high-range scenarios (taking the expected technological improvements into account, such as more fuel efficient engines, and better airframe designs).

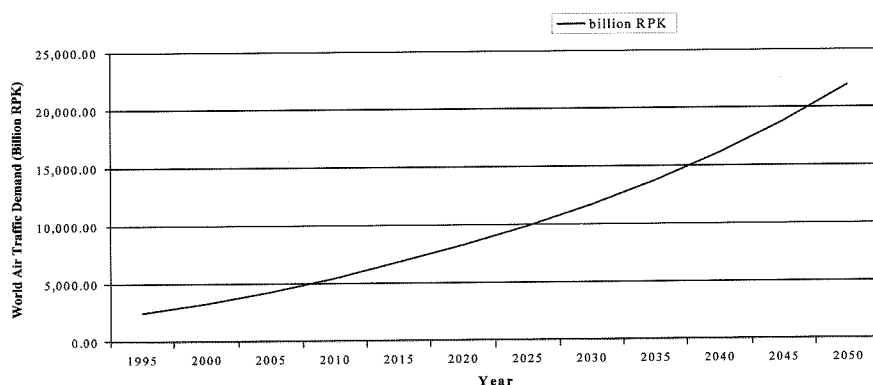
Experts in the aviation, scientific and environmental communities all agree that the aviation industry will continue to grow globally and contribute increasingly to human-generated greenhouse emissions. The players differ, however, on the rates of growth foreseen, depending on their purposes. For example, where traffic projections and emissions are concerned, the aviation industry considers the mid-range scenarios to be overstated. On the other hand, environmental groups like the Environmental Defense Fund in the US (Vedantham & Oppenheimer 1998) and environmental think tanks such as the Centre for Sustainable Transportation (2000) in Canada, justify medium and high-range scenarios as being more consistent with industry projections and the energy projections of agencies such as NASA.

To concretise the concerns further, the Centre for Sustainable Transportation gives an example of a person flying from Toronto to Paris and back - about 12,000 kilometres. The combined effects of all aircraft emis-

sions at the level subsonic aircraft normally fly, 10 to 11 kilometres above ground, is about three times that based on carbon dioxide alone (Penner et al. 1999: 213). Assuming average occupancies of cars and aircraft, the global warming contribution is thus similar to driving a car for 36,000 kilometres. As the average Canadian travels about 16,000 kilometres per year by car, the Centre thus estimates that one trans-Atlantic round trip would be equivalent in global warming impact to more than two years of car travel.

Clearly predictions of traffic demands and emissions beyond the year 2015 become increasingly uncertain because the probability of unforeseeable changes in key factors increases with time. The IPCC report presents a wide range of possible scenarios to investigate long-term projections to the year 2050, with an example given below of a medium-range scenario prepared by the Forecasting Economic Analysis Subgroup (FESG) of the International Civil Aviation Organization (ICAO) (Penner et al. 1999: 312).

This scenario (labelled Fe by them) is based on higher growth rates than their base case scenario, but is given as an example here as it is consistent with industry projections, and is below the higher projections still of the US Environmental Defense Fund scenarios.



Source: International Civil Aviation Organization (ICAO) data from Penner (1999:312)

**Figure 1 World air traffic demand scenario to 2050 (Revenue Passenger-Kilometres)**

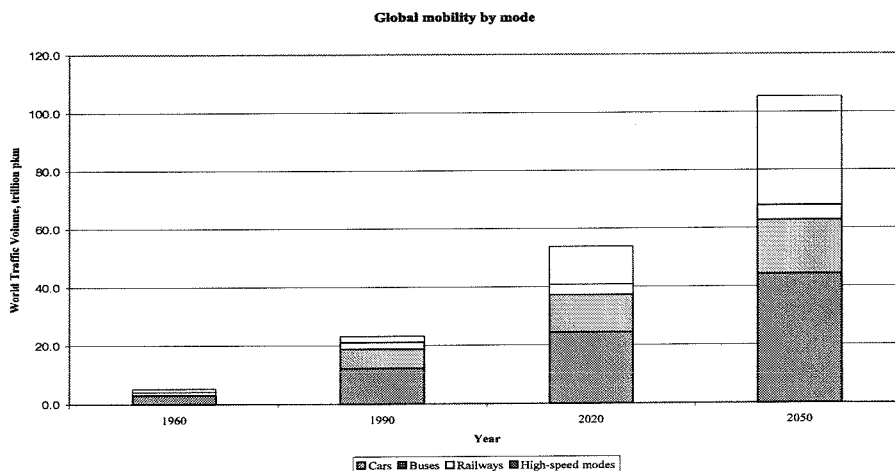
If the assumptions of this scenario were to be fulfilled, the Centre for Sustainable Transportation argues that the global warming impact of aviation in 2050 could exceed that of either trucks or the contribution by cars.

### *The Future Mobility of the World Population - Another View*

Schafer and Victor (Schafer & Victor 2000) tackled the questions “how much will people move around in the distant future?” and “what modes of transport will they use?” using a model that addresses regional and global long-term scenarios. Their model projects future mobility for 11 world regions from 1990 to 2050, and is an integrated model in the sense that it takes into account competition between different modes of transport, namely buses, trains, cars, and aircraft.

Of particular interest in relation to aviation futures, is the model’s use of a significant travel theory which postulates that travel time and money budgets exist. The theory suggests that people spend a constant share of money on travelling, and hence rising incomes lead to a rising demand for mobility. Surveys from various cities and countries throughout the world also suggest that a person on average spends a constant share of time on travel, namely 1.1 hour per person per day. Thus, as total mobility rises, travellers switch to faster modes of travel to remain within the fixed travel time budget of 1.1 hour per day.

The outcome of Schafer and Victor’s work is shown in Figure 2, which shows historical and estimated future global mobility (measured in passenger-kilometres, pkm) for each transport mode for the years 1960, 1990, 2020 and 2050.



Source: Schafer and Victor (2000)

**Figure 2 Historical and estimated future total global mobility by mode of transport**

The model suggests that by 2050, all transport modes except for aircraft are in relative decline, with only aircraft growing. Aircraft would provide 36% of global mobility in 2050, with cars supplying 42% of mobility. Figure 2 shows that the absolute mobility for each mode increases even for modes that are in relative decline. By 2050, high speed mobility rises to 18 times its 1990 level. In North America, high speed transport (mainly aircraft, but also high speed trains) is projected to supply 71% of the mobility share.

This work points to a pattern of high speed transport modes replacing slower ones. This flows from the underlying theory related to growing economies in each region stimulating greater travel demand, with the fixed travel time budget requiring travellers to shift to faster modes of transport. Shafer and Victor's model assumes that transport systems behave in a deterministic fashion. Further, it assumes that shifts to extreme mobility depending on access to high speed transport modes is a logical stepwise pattern, which will become more common than at present.

Of course, Schafer and Victor's conclusions depend on the validity of the travel time budget theory informing their work. Some researchers have questioned this theory. However, Mokhtarian and Salomon (2001), in considering both sides of the debate, believe that the empirical evidence from each supports at least a modified version of the travel time budget theory.

A corollary to the model appears to be a considerable degree of technological determinism as well - with the prospect of large subsonic aircraft with capacities of 1000 people, and the progression through supersonic and hypersonic transport. "The world would essentially become a global city, the subcenters of which are connected by high-speed links" (Schafer 1998). In essence, the conclusions from this particular avenue of research point to future societies with very high levels of mobility, or "hypermobile" societies by current standards.

### *The Globalisation of Tourism - A Political and Economic Context for World Aviation Futures*

The consumption of aviation travel and tourism have become integrally linked in the latter half of the twentieth century. After the Second World War, the developments in aircraft technology including the introduction of commercial jet aircraft in the 1950s became an important driver



in the growth of tourism. The mass impact of air travel on the expansion of tourism is encapsulated in a description of the expansion as being “beyond the wildest expectations of travellers at the beginning of the twentieth century” (Swinglehurst 1998: 92). The huge growth in international tourism since the 1950s is illustrated by international tourist arrivals climbing from 25 million in 1950 to 664 million in 1999, corresponding to an average annual growth rate of 7% (World Tourism Organization 2000).

Increasingly, the tourism industry is considered to be an amalgam of different businesses and organizations operating within the context of economic globalisation, as discussed for example in the book, *The globalization of tourism and hospitality* (Knowles et al. 2001). Such businesses include, for example:

- Airlines
- Travel agents and tour operators
- International hotels and other accommodation
- Theatres and entertainment

Most of these businesses are transnational corporations operating on a global scale. As Knowles et al. (2001) point out, the boundaries between tourism, travel, leisure and accommodation are not easy to define since they blend gradually or overlap with each other. For example, airline passengers are encouraged to join frequent flyer programs with rewards according to distance travelled (Hanlon 1999), and “fly-buy” schemes linked to credit cards underline the link between the consumption of both travel and non-travel items.

Aronsson (2000) also suggests that the driving force behind such travel and tourism developments is primarily the global economic system, with the process of globalisation also facilitated by forces of social and cultural change linked to the development and impact of information technology and the mass media. Local places on earth are thus subject to global processes, which have economic, social, cultural and ecological consequences. For example, economic globalisation rests on an assumption of highly mobile societies, and this has important environmental ramifications.

Thus the context for tourism and travel is one of globalisation and international business motivation, supported in turn by political systems. The World Travel and Tourism Council (WTTC) (Department of Industry Science and Resources 2001: 1) estimated that the travel and tourism industry:

- Contributed 11.7 per cent to the world's Gross Domestic Product (GDP) in 1999
- Directly or indirectly accounted for almost 200 million jobs worldwide, or 8% of the world's total employment in 1999
- Will employ 254 million people by 2010

In its position statement on air transport and freer world trade, the WTTC calls for a liberalisation of trade, transport and telecommunications. In relation to air transport in particular, the Council states: "a freeflowing, competitive air transport system is fundamental to this development. It will fuel markets through price competition and service innovation" (World Travel and Tourism Council 1997: 1).

A common explanation of the economic growth/air travel link relates to increasing personal income and propensity to travel, as well as increasing business activity. Demand for air freight services is also seen to be strongly determined by economic growth.

Wheatcroft (1994), writing for the World Tourism Organization (WTO), points to the fact that air arrivals account for 70 per cent of tourist arrivals in at least 20 major tourism countries, with ten such countries (including Australia, New Zealand and Japan) reporting almost all international arrivals by air. This relationship is not as strong in Europe where air travel accounts for approximately a quarter of international arrivals. Here other transport means have met the growing demand for travel, including cars making relatively short trips which cross borders, and thus inflate international statistics.

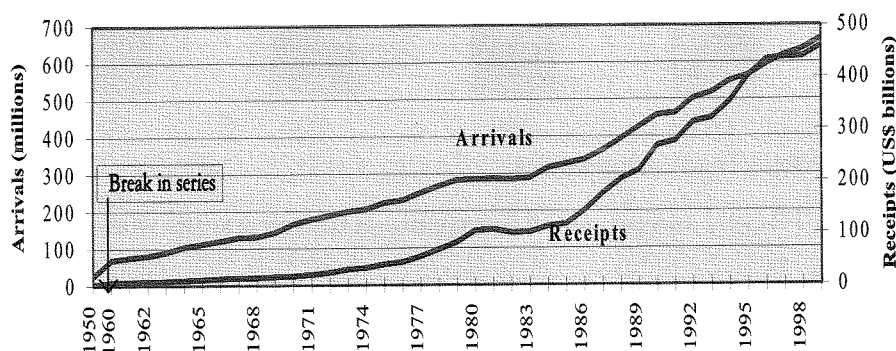
In keeping with the World Tourism Organization's bias towards the "economic objectives of tourism policies [as] paramount," Wheatcroft concludes that many governments are recognising the need to modify protectionist aviation policies in order to facilitate the growth of tourism, both domestically and internationally.

Of course, the terrorist events of September 11, 2001 in the USA have had a strong negative impact on the travel and tourism industry, although the World Travel and Tourism Council's longer-term forecasts are still very strong (World Travel and Tourism Council 2001). Nevertheless, perceived threats to economies have led to the formation of an industry coalition of travel and tourism associations from around the world with the WTTC. The industry coalition encompasses airlines and airports, manufacturers, hotels and restaurants, tour operators and retail agents, travel related

services, and credit card and rental companies. A catastrophic event of this kind has served to emphasise the web of business and economic interests surrounding aviation travel in the context of a global economic system.

### *Tourism Forecasting*

Using tourist arrivals and tourist receipts as indices of global travel forecasts is one way of estimating demand in the future and of understanding past trends. In relation to tourist arrivals, the World Tourism Organization collects historical time series data. This data shows that the number of international tourist arrivals (i.e. arrivals from abroad) has increased by an average annual growth rate of 6.9% since 1950, from 25 million international arrivals in 1950 to 664 million in 1999 (World Tourism Organization 2000) (see Figure 3)



Source: World Tourism Organization and Hamal (2000)

**Figure 3 International tourist arrivals and tourism receipts, 1950-1999**

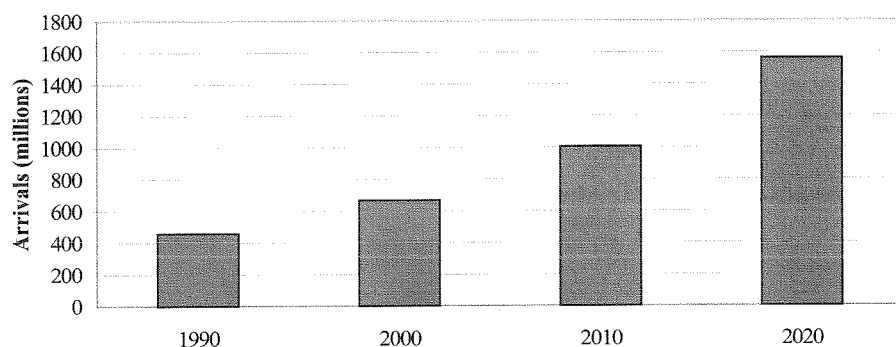
Parallel growth is shown by the increase in tourism receipts from \$US 2.1 billion in 1950 to \$US 455 billion in 1999 (Hamal 2000; World Tourism Organization 2001b).

The World Tourism Organization's recent Tourism 2020 Vision program of research (World Tourism Organization 1999) is an extension of its earlier work on tourism forecasting, which produced a series of forecasting reports for each of six WTO regions and a global volume (World Tourism Organization 1995).

The Tourism 2020 Vision program encompassed survey responses from 85 countries and a survey of approximately 50 tourism "visionaries" as WTO described them. The latter included tourism and travel

companies; suppliers to the tourism industry; and researchers, writers, publishers and academics in tourism, economic and political fields.

For the medium term, an average annual growth rate of international tourism arrivals of 4.1% for the period 1995 to 2020 was forecast, with the numbers of international tourism arrivals expected to reach one billion by 2010 and 1.6 billion by 2020 (see Figure 4). This forecast has been reaffirmed in WTO documents examining the prospects for tourism after 11 September 2001 (World Tourism Organization 2001a).



Source: World Tourism Organization

**Figure 4 Actual and projected international tourist arrivals worldwide**

Of interest in relation to aviation, the Tourism 2020 Vision work also suggests that over the period 1995 to 2020 there will be a rise in the long-haul share of arrivals, with tourists travelling further afield. The 1995 intraregional/long haul travel ratio of 82:18 is forecast to shift to a 2020 ratio of 76:24. This corresponds to average annual growth rates of 3.8 per cent and 5.4 per cent respectively, with long-haul travel worldwide growing faster than intraregional travel.

### ***Ramifications***

Aviation travel is thus inextricably bound up with larger economic and political processes, including that of economic globalisation - and in particular the globalisation of tourism. However, transport, and in particular aviation travel as a subsystem of the tourism system, has been a largely unexamined area of that system, especially in relation to ecological sustainability. If anything, aviation is viewed as a strong instrument for the promotion of economic globalisation (World Travel and Tourism Council 1997).

Only recently have papers begun to appear suggesting that tourist travel is a major source of environmental problems, thus linking the notions of sustainable tourism and sustainable mobility (Hoyer 2000). He cites one study of a large tourist region in Austria which concluded that 40 to 60% of the environmental loads linked to tourism are from the *transport* of tourists between their homes and the Tyrol tourist region in Austria, as well as from local transport within the destination area.

In the case of aviation, he argues for strong measures including environmental taxes, to reduce the volume of international tourist travel by aircraft. This is because of the increase in the global impacts of such activity and the large tourism contribution to such international and long distance flights. Such measures naturally are inimical to the objectives of the aviation industry. He cites the Scandinavian Airlines System (SAS) as being notable for its efforts to reduce environmental impacts. However, despite their best efforts, SAS has admitted that future growth in air transport, largely linked to tourism, will only increase environmental impacts.

It is true that the image of tourism as a "smokeless industry" is changing to some extent to one implicated in an array of global and local ecological concerns. This is reflected in terms which became popular in the 1990s such as "eco-tourism," "green tourism," and "sustainable tourism," and in a number of recent books e.g. Holden (2000) and journals such as the *Journal of Sustainable Tourism*. These so called "alternative" forms of tourism carry a variety of other labels too, including "appropriate," "responsible," and "soft," suggesting that they are "more sustainable."

Wheeller (1997: 67) argues, however, that "responsible tourism" is a superficial distraction, and fails to address "the real problem of mass tourism - the massive volume and, globally, the growing absolute number of tourists."

One shadow side to mass tourism is the more widespread opposition to the spread of Western and particularly US values and practices. Mann (2001) quotes David Kay, a United Nations weapons inspector in Iraq in 1991-92, as saying that terrorists are acting on the perception of the U.S. as the agent of spreading "Disney-fication, McDonald-ization, and vulgarisation worldwide."

This was seen in its most extreme form in the September 11, 2001 terrorist attacks on the symbols of world trade power in New York. This event highlighted how a hijacked airliner can act as a "fuel air bomb." Although greater attention is now being given to aviation security,

Wilkinson foreshadowed such risks in 1999 when he wrote that (Wilkinson & Jenkins 1999):

*...while the improved aviation security measures in certain countries have certainly deterred and prevented many attacks, it is clear that the major international terrorist players have the resources, sophistication and ruthlessness to find the weaknesses in global aviation security and to commit mass murder on the airways on a scale we have not seen before.*

Such risks continue today.

### ***Applying Causal Layered Analysis to Aviation Futures***

Here we apply causal layered analysis to a consideration of aviation futures. Causal layered analysis (CLA) is a futures research method that focuses on vertical layers of analysis, in contrast to other techniques such as scenarios which direct attention to alternative horizontal discourses.

Inayatullah (1998) has facilitated the theory and application of this approach, and layered methodology is also the subject of a recent special issue of the journal *Futures* (August 2002). In this issue, the particular value of the approach is summarised well by Inayatullah (2002: 479) when he says that "conventional methods used to forecast, to interpret and to create desirable visions of the future are of little use if they are unable to unpack worldviews, ideologies and discourses, not to mention archetypes, myth and metaphors." Thus adding a vertical dimension to our analysis adds depth to the earlier predictive and interpretive approaches, enabling a more holistic perspective.

### ***Causal Layered Analysis (CLA) in a Nutshell***

In essence, the layered approach used in causal layered analysis draws on four levels:

- The "*litany*" level or official public description of an issue, for example as might appear in news media. Quantitative trends are often used for political purposes, and conventional accounts of reality predominate.
- The *social science analysis level* concerned with social causes, and which seeks causal variables to explain economic, political, technological, ecological or historical factors. Technical and economic analyses from various policy institutes characterise this level.

- The *discourse analysis/worldview level*, a deeper level that recognises that how one frames a problem is a critical issue. Hence discerning the deeper issues which inform and constitute the discourse/s is what matters. Solutions often centre on consciousness transformation and in rethinking the politics of reality.
- The *myth/metaphor level* focusing on deep stories, the unconscious, and collective archetypes. This level draws on heart rather than head, and visual and body images from gut level emotional experience engage mythical frameworks of knowing.

Such an approach thus acknowledges that how one frames an issue changes the solutions, and recognises that language is part of the analysis. The various layers lead to different conceptions of which actors are involved in creating transformations. By moving up and down the levels of analysis, different ways of knowing are brought to bear on an issue.

### *Causal Layered Analysis Applied to Aviation Futures Scenarios*

In relation to aviation futures, Table 1 provides a summary analysis. It encompasses both a horizontal dimension via a range of scenarios, and applies the causal layered analysis depth approach to each scenario, using the four levels of reality described above. Given the chaotic and complex nature of futures conceptions, of known and unknown, the scenarios and corresponding vertical levels are of course not entirely mutually exclusive. Inayatullah (1998) argues that the usefulness of causal layered analysis “is not in predicting the future but in creating transformative spaces for the creation of alternative futures.” Horizontally, there can be some interaction across scenario boundaries, as each scenario to some extent “can represent a different way of knowing,” and is not a watertight compartment with a definitive “take” on truth. Vertically, pondering more deeply on how we got to where we are is helped by uncovering the myths and metaphors shaping our reality now. To know where we want to go, we can experiment with alternative metaphors and visions.

Hence, causal layered analysis is used here to question conventional framings of issues, and to open up new possibilities.

#### *The “Growth Forever” Scenario*

The “growth forever” scenario is typical of the upward projections for tourism given by the World Tourism Organization mentioned earlier. If there is a myth of nature underlying it, it is very robust or nature seen as

brute matter. As Dryzek (1997) points out, the metaphors and language are generally mechanistic and the language privileges entities like consumers, markets, prices, energy, and technology. Free market forces and economic globalisation underlie the worldview. The typical market-based neoliberal economic viewpoint is expressed by a leading researcher in the transport area: "A major criterion for measuring the success of our air transportation system should be our ability to use air travel as a competitive advantage in a global economy" (Button & Taylor 2000).

Another tactic of the "no limits" metaphor of economism is the extrapolation of single variable trends into the future. Consider again the growth in tourism arrivals shown in Figure 4 earlier. The "sky is the limit."

At the myth level, this projection of past trends into the future has been well critiqued by Mumford (1971) in his assessment of the industrial (now globalising) era: "There is only one efficient speed, *faster*; only one alternative destination, *farther away*; only one desirable size, *bigger*; only one quantitative goal, *more*."

### *Inner and Outer Travel*

The "Inner travel" scenario in Table 1 provides an interesting contrast to the "growth forever" scenario. Its taoist underlying worldview is no doubt characteristic of scenarios which represent a call to return to the simpler, less complex ways of the past. The association with inner journeys of a mystical rather than materialistic kind, is reflected in this quote from the Taoist classic the *Tao Te Ching* by Lao Tzu (Bahm 1958/1979):

*Without going out-of-doors, one can know all he needs to know.*

*Without even looking out of his window, one can grasp the nature of everything. Without going beyond his own nature, one can achieve ultimate wisdom. Therefore the intelligent man knows all he needs to know without going away, and sees all he needs to see without looking elsewhere, and does all he needs to do without undue exertion.*

At the myth/metaphor level, the wisdom by staying at home philosophy propounded by the *Tao Te Ching* may in fact represent part of the solution to so called "travel demand management" approaches suggested in the literature on sustainable transport. It is certainly an image worth considering in contrast to the one of wealthy eco-tourists jetting into "green eco-resorts" in deepest Peru, each burning tonnes of carbon dioxide getting there and back.

Such a scenario opens up other important themes too. "Time is money" and "time pressure" characterise the idea of a "society running out of



time" lying at the base of the "growth forever" scenario. A focus on "living in the now" and appreciating the moment is characteristic of a more contemplative approach which respects the rhythms of nature, as encapsulated in Taoist philosophy.

While part of this scenario may imply a yearning for the past, Elgin's (1997: 19) work on global consciousness change draws on national surveys by Paul Ray in the USA, in which he identified a group of "cultural creatives" who may represent a new and distinctive social force. Representing about 10% of the US adult population, this group supports values and practices linked to ecological sustainability, self-actualisation and spiritual practice. As Elgin says, "The core cultural creatives are building ways of living that connect inner and outer, material and spiritual, into a meaningful whole."

Similarly, Inayatullah's (1993) analysis of alternative scenarios for the future of tourism posits one scenario being linked to structural and psychosocial changes. In this case, structures move away from a corporate and capital-intensive focus to, for example, employee ownership of tourism centres. People become more socially and ecologically conscious and the meaning of tourism at a personal level evolves beyond "fragmented selves in search of wholeness or defeated selves desiring to forget."

The notions of identity and meaning thus become critical, and policies emanating from an identity constructed around the idea of the "freedom to fly" contrast with the idea of wisdom attained "without going away."

Relevant to policy making here is Hill's (1999) contention that the commonly used holistic frameworks focus on three main categories of economic, social and environmental factors, thus specifically excluding the personal. This embeds the privileging of economics and monetary priorities over a broader values-based system of decision making. It promotes a consumer identity at base of the market model, who is on a restless search for attractions and temptations. For us then, a more useful model encompasses ecological, personal (including "spiritual") and social (including economics, politics etc) issues.

#### *The "Redesign (Ecological/Spiritual)" Scenario*

In the "redesign (ecological/spiritual)" scenario, in contrast to the single variable and mechanistic assumptions of the "growth forever" scenario, global limits are recognised and the myth of nature is one of a fragile organic balance to be respected. Further, nature is conceptualised as a web of complex ecosystems. Bright (2000), for example, presents a num-

ber of case studies to demonstrate how human pressures on the earth's natural systems increasingly lead to unanticipated surprises as a result of discontinuities and synergisms from several combining phenomena.

At the social science analysis level, even considering just one extra phenomenon, the likely impacts of depleting world oil supplies, paints a much different picture than that under the "growth forever" scenario. Fleay (1999) gives a useful overview of the issue of climaxing oil production, considered by many experts in the area as likely in the next decade or so. The first international experts' workshop on this critical but not widely recognised issue was held in Uppsala, Sweden in 2002 <<http://www.isv.uu.se/iwood2002>>. Such an imminent decline in the world's supply of oil calls for radical changes in the economic principles guiding societies.

Current aviation growth scenarios begin to look problematic, as the technology is tied to oil, and given that the introduction of alternatives such as hydrogen powered aircraft, is likely to take decades. This is because of the lead time required for new designs, and also because existing aircraft have a typical life expectancy of 25 years.

At the myth/metaphor level, feminine images abound, as in the idea of "returning to nature," and in the Gaian notion of the development of a planetary self-reflective consciousness - where the planet and cosmos are perceived as "fundamentally alive" rather than just brute matter.

The matching identity of people is that of conscious co-creators in a unified "conscious evolution" (Hubbard 1998). Such a worldview has links with the Romantic tradition which values the emotional life of individual people, and seeks a value of "harmony between humans and nature." To the extent that consumption is recognised, it is seen to be conscious, rather than the conspicuous and profligate consumption characteristic of the "growth forever" scenario.

At a systemic level, the worldview and metaphors focus on "fundamental redesign" of systems, to encompass ecological notions such as collaboration, mutualism, and synergy. Such "deep" approaches contrast with "shallow" approaches such as "efficiency" and "substitution" seen in status quo scenarios (Hill 1999: 203).

#### *"Sustainable Development" Scenarios Vis-a-vis "Fundamental Redesign"*

The latter shallow approaches are typical of the "sustainable development" scenario, which at its base rests on metaphors of "progress" and the notion that "we can have it all" (Dryzek 1997). Thus, while quieter and much more fuel efficient aircraft are no doubt sensible optimisations of the use of current technology, the "rhetoric of reassurance" never gets to grips with fundamental changes required by the ecological scenario.

For example, even “substitution” strategies such as hydrogen-powered aircraft, which would not produce greenhouse gas carbon dioxide emissions, could leave existing consumption patterns in place, or still have significant global warming consequences from the water vapour contrails left in their paths, as water vapour acts as a greenhouse gas too (Penner et al. 1999: 257).

The “fundamental redesign” scenario looks for deeper solutions. Such a framework often views the “sustainable development” scenario as an attempt to validate the business as usual, globalising agenda. In contrast, it draws on new understandings from ecology and psychology to enable the redesign, and is profoundly different from the usual “tinkering” approaches that aim to improve efficiency within flawed designs (Hill 1999).

The “redesign” scenario recognises that in the medium term, future growth in air traffic is expected to far outstrip any efficiency gains. Need-reduction and desire-reduction strategies go hand in hand with ideas such as “access rather than mobility” (OECD 1997). Access rather than mobility suggests less need for the movement of people and goods, for example where improved telecommunications provide increased access to others without the need for physical travel. In a “redesign” scenario then, investment and production could be locally focussed, so that the international movement of goods and materials is greatly reduced, as is the need for long distance business travel (Korten 1999).

#### *The “Cyber-revolution” and “Crash” Scenarios*

Video conferencing and intensified interregional electronic communication can facilitate the “cyberspace communities” promoted in the “cyber-revolution” scenario. However, because of the need for human touch and face-to-face interaction, “communities of place” are highly valued given the much higher priority on meaningful relating to self and others in the myths underlying the “redesign (ecological/spiritual)” scenario.

Moriarty (2000) points out, however, that information technology can act to either augment or replace travel, depending on the circumstances. He concludes that net reductions in travel are not guaranteed if present transport policies continue. Only if concerns about oil depletion or global warming intensify, together with policies which encourage travel reduction, will IT be a means of helping to solve these problems.

Lastly, the “crash” scenario represents the shadow side of the “growth forever” scenario, drawing on myths such as the “tragedy of the commons,” “overshoot and collapse,” and cancer analogies eating at runaway growth.

Such a scenario presents images of increasing ecological dysfunction as in erratic climate patterns and their consequences. Insurance companies have increasingly recorded this in their bottom lines.

Other possibilities include the ramifications of depleted resources as in the "big rollover" for oil reserves, suggested as a major turning point in history (Robinson 2001). This is the point, estimated to be around 2010, where humankind's ascent up the "oil production" mountain flips over to the descent down the mountain. The ramifications are vast, with the likelihood of inflation, recession, and international tension, given that the remaining reserves will be primarily in the Middle East (Bentley 2002).

Further, the "crash" metaphor and September 11 are now etched into people's memories as a symbol of the conflict between terrorism on the one hand, and economic globalisation's symbols, as in the destroyed World Trade Centre towers, on the other.

### *Conclusion*

The dominant thinking about the growth of demand in the aviation industry is that it is indisputable and good. Similarly, "growth forever" scenarios as expressed in the globalisation of tourism, and the related expansion of hotels, airlines, and consumerism generally are considered in the same light.

Other scenarios presented here challenge these assumptions and the worldview underlying it. Ecological and environmental considerations related to a "return to nature" challenge the status quo scenarios, and also conceptions of what it means to be human. For example, consumer identities plugged into a frenetic and increasingly fast "hypermobility" have been contrasted here with images from perennial traditions such as Taoism, and more feminine priorities towards caring and relating in meaningful ways.

The implications vary with the audience:

- Politicians and policy makers involved in the rapid expansion of airports and airport developments around the world might look again at whether economies and airport developments must become increasingly integrated. Such developments are predicated on the continuing expansion of aviation, and many of the infrastructure developments may turn out to be unwise investments. What if world oil production peaks around 2010, as many experts think?

- Transport policy makers and planners might consider the implications of “need reduction” and “demand management” strategies for aviation travel, including switches to other modes of travel which are less ecologically demanding, and towards meeting the needs for access rather than mobility. How might the aviation industry itself contribute to such a shift? For example, investment in fast train services rather than aircraft is more greenhouse friendly, particularly for short haul travel.
- All of us, especially those in industrial societies, might reconsider our priorities. Images of “big is best” and of the “freedom to fly” need to be contrasted with ecologically conscious and slower ways of life. Ways of being in the world which emphasise relating, learning and community are healthful and ennobling. In contrast, a person rewarded for the number of “frequent flyer” points earned might be encouraged, even required, to assume responsibility for his or her contribution to greenhouse gas emissions.

Causal layered analysis has been used here to raise different images for aviation futures. Such a process suggests the possibility of reframing and rethinking people’s need to travel and of rethinking tourism, especially international tourism. It also raises the issue of including the “personal” in policy considerations, and certainly of a more ennobling view of the personal than one predicated on consumerist priorities.

## References

- Aronsson, L. 2000. *The Development of Sustainable Tourism*. London, UK: Continuum.
- Bahm, A. J. 1958/1979. *Tao Teh King by Lao Tzu: Interpreted as Nature and Intelligence*. New York: Frederick Ungar Publishing.
- Bentley, R. W. 2002. Global Oil & Gas Depletion: An Overview. *Energy Policy* 30(3): 189-205.
- Bright, C. 2000. Anticipating Environmental “Surprise.” In L. R. Brown, C. Flavin & H. French (Eds.). *State of the World 2000: A Worldwatch Institute Report on Progress toward a Sustainable Society*. Pp. 22-38. London: Earthscan.
- Brown, L. R., M. Renner & B. Halweil. 1999. *Vital Signs 1999-2000*. London: Earthscan.
- Button, K. & S. Taylor. 2000. “International Air Transportation and Economic Development.” *Journal of Air Transport Management* 6(4): 209-222.
- Buxton, R. 2001. High Relief. *The Ecologist* 31(10): 62. Cornwall: Wadebridge.

- Centre for Sustainable Transportation. 2000. *Sustainable Transportation Monitor* (No.3). Retrieved 2 May, 2001. from <<http://cstctd.org/CSThomepage.htm>>
- Citrinot, L. 1999. New Commercial Strategies for Airports. *Travel & Tourism Analyst* 3: 1-19.
- Department of Industry Science and Resources. 2001. *Tourism Industry Trends: April* 2001. Canberra: Author.
- Department of the Environment Transport and the Regions. 2000. *The Future of Aviation: The Government's Consultation Document on Air Transport Policy*. London: Author.
- Done, K. 2002. *Airport Lobby Calls for Investment in Airports*. Retrieved 9 May, 2002. from <<http://news.ft.com>>
- Dryzek, J. S. 1997. *The Politics of the Earth: Environmental Discourses*. New York: Oxford University Press.
- Elgin, D. & C. LeDrew. 1997. *Global Consciousness Change: Indicators of an Emerging Paradigm*. San Anselmo, CA: Millennium Project.
- European Federation for Transport and Environment (T & E). 2001. *T & E Bulletin No 99 (June): Action Taken across Europe against Noise Headache*. Retrieved 5 August, 2001. from <<http://www.t-e.eu>>
- Fleay, B. J. 1999. *Climaxing Oil: How Will Transport Adapt?* (Paper No 1/99). Perth, Western Australia: Institute for Science and Technology Policy, Murdoch University.
- Hamal, K. 2000. *Global International Travel Demand and Australia in the Early Twenty-first Century*. Paper presented at the Australian Tourism and Hospitality Research Conference 2-5 February 2000. Australia: Mt Buller.
- Hanlon, P. 1999. *Global Airlines: Competition in a Transnational Industry* (2nd ed.). Oxford, UK: Butterworth-Heinemann.
- Hill, S. B. 1999. Social Ecology as Future Stories. *A Social Ecology Journal* 1: 197-208.
- Holden, A. 2000. *Environment and Tourism*. London, UK: Routledge.
- Hoyer, K. G. 2000. "Sustainable Tourism or Sustainable Mobility? The Norwegian Case." *Journal of Sustainable Tourism* 8(2): 147-160.
- Hubbard, B. M. 1998. *Conscious Evolution: Awakening the Power of Our Social Potential*. Novato, CA: New World Library.
- Inayatullah, S. 1993. *Rethinking Tourism: Unfamiliar Histories and Alternative Futures*. Retrieved 16 August, 2001. from <<http://www.metafuture.org/Articles/TOURISMFutures.htm>>
- \_\_\_\_\_. 1998. "Causal Layered Analysis: Poststructuralism as Method." *Futures* 30 (8): 815-829.
- \_\_\_\_\_. 2002. "Layered Methodology: Meanings, Epistemes and the Politics of Knowledge." *Futures* 34(6): 479-491.
- IPCC. 2001. *IPCC Third Assessment Report: A Report of Working Group I of the Intergovernmental Panel on Climate Change: Summary for Policymakers*. Retrieved June 21, 2001. from <<http://www.ipcc.ch/>>

- Knowles, T., D. Dimitrios & J. B. El-Mourhabi. 2001. *The Globalisation of Tourism and Hospitality: A Strategic Perspective*. London, UK: Continuum.
- Korten, D. C. 1999. *The Post-corporate World: Life after Capitalism*. Sydney: Pluto Press (reprinted by arrangement with Kumarian Press, West Hartford, CT, USA).
- Lenzen, M. 1999. "Total Requirements of Energy and Greenhouse Gases for Australian Transport." *Transportation Research Part D* 4(4): 265-290.
- Mann, P. 2001. *Terrorist Mass Murder: New "Weapon of Choice."* Aviation Week & Space technology. Retrieved 15 May, 2002. from <<http://www.aviationnow.com>>
- Mokhtarian, P. L., & I. Salomon. 2001. "How Derived is the Demand for Travel? Some Conceptual and Measurement Considerations." *Transportation Research Part A* 35(8): 695-719.
- Moriarty, P. 2000. *Transport and the Environment (Tela issue 6)*. Melbourne: Australian Conservation Foundation.
- Morris, S. 2002. *Airport Threat to Precious Wetlands*. Retrieved 9 May, 2002, from <<http://www.guardian.co.uk>>
- Mumford, L. 1971. *The Pentagon of Power*. London: Weidenfield & Nicholson.
- Nero, G., & Black, J. A. 2000. "A Critical Examination of an Airport Noise Mitigation Scheme and an Airport Noise Charge: the Case of Capacity Expansion and Externalities at Sydney (Kingsford Smith) Airport." *Transportation Research Part D* 5(6): 433-461.
- OECD. 1997. *Towards Sustainable Transportation: Conference Organised by the OECD Hosted by the Government of Canada, Vancouver, BC, March 1996*. Paris: OECD.
- Penner, J. E. et al. (Eds.). 1999. *Aviation and the Global Atmosphere: A Special Report of IPCC Working Groups 1 and 111*. Cambridge, UK: Cambridge University Press for the Intergovernmental Panel on Climate Change.
- Robinson, B. 2001. *The "Big Rollover": World Oil Production Decline Predications*. Retrieved 30 October, 2001, from <<http://www.bml.csiro.au/bigrol.htm>>
- Schafer, A. 1998. "The Global Demand for Motorized Mobility." *Transportation Research Part A* 32(6): 455-477.
- Schafer, A., & D. G. Victor. 2000. "The Future Mobility of the World Population." *Transportation Research Part A* 34(3): 171-205.
- Skogo, I. 2001. "Public Opposition to Air Transport Development Underscores Importance of Tackling Noise Issue." *ICAO Journal* 56(4): 22-23.
- Swinglehurst, E. 1998. "Face to Face: the Effects of Tourism on Societies Past and Present." In W. F. Theobald (Ed.), *Global Tourism* (2nd ed., pp. 82-97). Oxford, UK: Butterworth-Heinemann.
- Vedantham, A. & M. Oppenheimer. 1998. "Long-term Scenarios for Aviation: Demand and Emissions of CO<sub>2</sub> and NO<sub>x</sub>." *Energy Policy* 26(8): 625-641.
- Wheatcroft, S. 1994. *Aviation and Tourism Policies: Balancing the Benefits*. London, UK: Routledge/World Tourism Organization.

- Wheeller, B. 1997. "Tourism's Troubled Times: Responsible Tourism is not the Answer." In L. France (Ed.), *The Earthscan Reader in Sustainable Tourism*. Pp. 61-67. London: Earthscan Publications Ltd.
- Wilkinson, P., & B. M. Jenkins (Eds.). 1999. *Aviation Terrorism and Security*. London: Frank Cass Publishers.
- World Tourism Organization. 1995. *Global Tourism Forecasts to the Year 2000 and Beyond: Volume 1 the World*. Madrid, Spain: Author.
- \_\_\_\_\_. 1999. *Tourism 2020 Vision: Executive Summary Updated*. Madrid, Spain: Author.
- \_\_\_\_\_. 2000. *Tourism Highlights 2000* (2nd ed.): Author.
- \_\_\_\_\_. 2001a. *Tourism after 11 September 2001: Analysis, Remedial Actions and Prospects (updated November 2001) Special Report*, Number 18. Retrieved 20 December, 2001. from <<http://www.world-tourism.org>>
- \_\_\_\_\_. 2001b. *Tourism Highlights 2001*. Retrieved 18 March, 2002. from <<http://www.world-tourism.org>>
- World Travel and Tourism Council. 1997. *Air Transport and Freer World Trade: A Report from the World Travel and Tourism Council*. London, UK: Author.
- World Travel and Tourism Council. 2001. *Viewpoint*. Retrieved 27 February, 2002. from <<http://www.wttc.org>>



Table 1 Future of Aviation - Causal Layered Analysis

| Vertical levels                      | Growth forever  | ← VARIOUS Sustainable development   | Redesign (ecological/spiritual)  | SCENARIOS Inner travel   | → Cyber-revolution   | Crash  |
|--------------------------------------|---|---|--|--|--|--|
| <b>Litany</b>                        | Tourism growth<br>Mass tourism<br>Growth forever  | Sustainable tourism/<br>responsible tourism   | Questioning values and scale of tourism and hypermobility  | Low impact<br>Low travel   | Electronic revolution  | End of civilisation/<br>Crash<br>Travel problematic  |
| <b>Social science analysis</b>       | Free market forces<br>Economic growth<br>Trends of single variables extrapolated into future<br>Mobility<br>Markets, energy, technology | Ecological restructuring of capitalism<br>Responsible<br>Future oriented<br>Green technology e.g. hydrogen powered planes | Global limits<br>Nature<br>Organic balance<br>Complexity of human-nature interconnections<br>Analysis and redesign of systems                          | Social responsibility<br>Culturally sensitive<br>Gaining wisdom  | Communication networks<br>IT and Email<br>Anti-globalisation movements | Clash of cultures<br>Boom and bust<br>The "big rollover" – oil reserves running out<br>Terrorism<br>Ecological limits exceeded e.g. erratic climate events |
| <b>Discourse analysis/ worldview</b> | Economic globalisation  | Sustainable development<br>Social progress  | Eco-centric/redesign<br>Change of consciousness<br>Spirituality<br>Personal/communal   | Taoist   | Virtual reality  | Crash<br>Limits to growth  |
| <b>Myth/ metaphor</b>                | Sky is the limit<br>Endless holiday<br>Bums on seats<br>Time is money<br>Faster, farther away, bigger, more; the "freedom to fly"       | Reassurance<br>We can have it all<br>Progress – but environmentally benign  | Gaia<br>Conscious evolution<br>Planet earth is limited<br>Nature can't be bullied and will come back to bite us<br>We can't eat money<br>Time flexible | Wisdom by staying at home (Tao Te Ching)<br>Inner knowledge/inner travel<br>Keeping the balance<br>Pacific time<br>Time is eternal | World Wide Web<br>Instant communication<br>Chaotic connections         | Doom and gloom<br>Armageddon<br>Good vs. evil<br>Overshoot and collapse<br>Cancer analogy<br>"Nature has no reset button"                                  |

