

THE ROUTE DEVELOPMENT FUND (RDF) – CAN WE SUSTAIN AIR TRANSPORT IN THE REGIONS?

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1 ABSTRACT

Policy makers addressing the needs of more remote regions are faced with conflicting pressures with regard to air travel. In addition to the ubiquitous controversy surrounding the growth of air travel and its implications for the environment, the need can exist to provide socially necessary air services. Such services tend not to be financially sustainable and require external funding. One recently developed funding mechanism is the Route Development Fund (RDF). The paper provides an overview of the findings of an independent evaluation of the application of the RDF mechanism in Scotland, encompassing assessments of its impacts and challenges faced by policy makers.

2 INTRODUCTION

With the rising chorus of calls for policy makers to implement measures to reduce the demand for air travel it might appear perverse for Governments to be seen to promote air transport. This has been a feature of policy in the UK for many years for niche markets. These have focused on socially necessary services. However, airports and public bodies have offered various incentives to encourage the launch of new air routes. These come in many forms. Financial incentives tended to be publicly funded. Provisions exist for governments to tender air services being to be socially necessary but are not provided commercially. Within the European Union these are subject to rules on subsidies to air transport. Regulation, nevertheless, increasingly restricts the opportunity for employing such support.

A recent initiative is the Route Development Fund (RDF) model implemented in Scotland and in other parts of the United Kingdom. The difference between RDF and other support mechanisms is its focus on underpinning development of new routes. In contrast, the objective of Public Service Obligation (PSO) support is to promote inclusion. The purpose of the RDF fund has been to provide incentives to initiate new direct links that would benefit the overall economic development of the region. The aim of the RDFs is to promote new routes by facilitating sharing of risk between airports and airlines.

3 AIR TRANSPORT AND ECONOMIC DEVELOPMENT

Air transport is not only a substantial employer but also an important enabler for businesses to operate in an increasingly globalised marketplace. Access to air services is a key requirement for communities to preserve and enhance their economic standing (Small, 2007). Air transport also drives and facilitates

wider economic activity through connectivity (Bradley *et al.*, 2006; York Aviation, 2007).

Oxford Economic Forecasting (Oxford Economic Forecasting, 2006) claim that air transport underpins international trade, promoting growth and raising living standards by allowing countries to specialise goods and services for which they enjoy a comparative advantage. Nearly two-thirds of UK companies report that passenger services are either vital or very important for sales and marketing. Air services are particularly important for the UK's trade with the fastest-growing regions of the world economy, including India and China, and are likely to become even more important to UK's competitiveness in the world economy. Fifty-five percent of the UK's exports by value of manufactured goods to countries outside the EU are transported by air. Many imports depend on air services. More than 60% of imports of machinery, mechanical appliances and electric equipment from outside the EU are carried by air.

Numerous studies have confirmed the link between the provision of connectivity through transport networks and economic growth. Inter-urban and international connections enable the development of new production processes and, being able to nationally or internationally trade, regions and/or countries will benefit from the increase specialisation in the production of goods and services (Eddington, 2006). McQuaid *et al.* (McQuaid *et al.*, 2004) on the basis of a comprehensive review of literature on business location worldwide claim, "...that good air connectivity is vital to businesses operating on an international scale, and for the development of 'world cities' as business locations".

According to Oxford Economic Forecasting (Oxford Economic Forecasting, 2006) aviation supports the growing tourism sector. Nearly three-quarters of international visitors to the UK arrive by air (Scotland where 87%) (Strategic Research Department, 2007). Spending by visitors who arrive by air is equivalent to 1.1% of UK GDP and generates around 170,000 jobs across the country. Tourism accounts for 9.2% of all employment in Scotland (Strategic Research Department, 2007). Increased air services are likely to be needed if the government is to achieve growth in tourism by a third by 2010 (50% growth by 2015 for Scotland).

4 AIR TRANSPORT AND SOCIAL INCLUSION

A significant factor influencing the propensity for travel is 'affordability'. Baum (Baum, 2006) has reviewed the claim that Low Cost Carriers (LCC's) have widened inclusion, access and have created opportunities to travel. In some cases air transport is the only realistic means for a person from a small community to travel. There are some peripheral regions that are highly dependent on the provision of air transport (Pagliari, 2003). Omitting such services would inhibit movement, keep families apart, and suppress business and tourism growth (COSLA, 2002). Air travel has raised people's expectations; therefore failure of markets and lack of state intervention would raise fares and reduce availability to low income groups either for

holidays/short breaks, visiting friends and relatives, education, culture/religion and other personal travel (Shaw and Thomas, 2006).

'Affordability' is an issue not only for social inclusion but is also of significance for businesses, in particular small businesses and tourism. A CAA report (CAA, 2006) showed that approximately a fifth of Low Fare Airline (LFA) passengers are business travellers, indicating that they are also taking advantage of lower fares and the increased choice of routes from regional airports (Mason, 2000; York Aviation, 2007).

5 AIR TRANSPORT: SUSTAINING CONNECTIONS?

Although major cities, such as London, are able to support a wide network of air services other locations may have a more limited offering. This means that for many city pairs without direct air services either long surface journeys are needed to access an airport with a suitable operation or a connection is required between two flights at an intermediate hub. For example, an airport, such as Aberdeen offers services to the London airports, Manchester and a few European centres. To travel to New York or Rome requires a surface journey (e.g. to Edinburgh or Manchester) or a transfer connection through Heathrow or Schiphol. For an even smaller location, such as Kirkwall (Orkney), it is necessary to travel first to a location, such as Aberdeen, before accessing the wider air network that may, therefore, require two changes of aircraft producing negative time and price penalties that create a deterrent to travel.

There is, however, much controversy surrounding growth in air travel and its implication for the environment, in particular climate change, but also local air quality and noise disturbance around airports (Eddington, 2006; Shaw and Thomas, 2006). The outcome of this debate in terms of policy and regulation will have significant implications particularly for those locations dependent on air for access for business and tourism, as well as social needs. Failure to adequately address the potential losses attributable to not accommodating the growth in air travel would have serious ramifications for tourism and business that rely on world markets (Shaw and Thomas, 2006).

For this reason, airports, communities and governments have been anxious to see the establishment of more direct air services from airports serving remote settlements, peripheral regions and locations in the 'traffic shadow' of larger neighbours (Martin, 2008; Pagliari, 2005). This typically requires financial or other incentives to be offered to airlines to address the limited viability of a commercial operation (Pagliari, 2003). In the next section we review the range of mechanisms which have been employed in securing this goal.

6 AIR TRANSPORT AND STATE INTERVENTION: OVERVIEW OF SUPPORT MECHANISMS

Throughout the history of air transport airports and public bodies have offered various incentives to encourage the launch of new air routes. Financial incentives and mechanisms, which tend to be publicly funded, include:

- Route Development Fund (RDF);
- Public Service Obligation (PSO)/Essential Air Service Programme (EAS) (Reynolds-Feighan, 1995; Williams, 2005);
- Air Discount Scheme (ADS);
- Tax Holidays and Discounts (STRAIR, 2005);
- Revenue Guarantees (Dennis et al., 2008); and
- Community Ticket Trusts (Travel Banks).

Within the European Union the various publicly funded measures are subject to the rules of the European Commission on subsidies to air transport. Public funding is not the sole source of financial support, although regulation increasingly restricts the opportunity for employing such support. Non-financial incentives tend to be offered at airport level, for example offering efficient handling and check-in and baggage retrieval services, maintaining safety and security standards.

7 THE ROUTE DEVELOPMENT FUND: AN OVERVIEW OF ITS DEVELOPMENT IN THE UK

The most recent of these mechanisms to be deployed is the Route Development Fund (RDF). The purpose of a Route Development Fund (RDF) is to provide incentives through public funding from regional bodies to initiate new direct airline links that will benefit the overall economic development of the region, e.g. in-bound tourism, generation of new business links. The objective of RDFs is to promote establishment of new routes by facilitating the sharing of risk between airports and airlines. It is not intended to usurp the role of the airports and airlines in developing their business but rather to act as a catalyst for promoting links either not under immediate consideration or ones thought to have marginal business case in the short term. Funds are allocated to routes that are likely to become commercially viable after the first three years. At the end of this period a case could be made for the continuation of funding depending on the needs of the regions that the route serves.

A claimed benefit of a RDF is that it could contribute to raising the profile of the airports and regions concerned; encourage airports to be more dynamic in their marketing and generally attract interest from airlines (especially those that view UK regions as a growth opportunity for new capacity) (CAA, 2005). In contrast however there is no guarantee that routes which receive RDF funds will ultimately prove to be financially viable in the longer term. The extent of the use of RDFs in the UK is illustrated in Table 1 below.

Table 1: Number of RDF route initiatives recommended for development (CAA, 2007)

Country		Total
Scotland	Domestic	13
	International	48
	Total	61
Northern Ireland	Domestic	3
	International	6
	Total	9
Wales	Domestic	1
	International	4
	Total	5
North East	Domestic	1
	International	5
	Total	6
UK total		81

Overall, in the UK, 81 routes fulfilled the criteria for receipt of aid through the Route Development Fund, of which 10 were implemented in 2003, 19 in 2004, 13 in 2005, 23 in 2006 and 16 in 2007.

In the case of Scotland the focus has been on new services which have an average frequency of at least five return trips per week, operating on an all year round basis and which would not go ahead without RDF investment. Outside Scotland's central belt airports, the frequency criteria are more flexible for routes to the new EU Member States in Central and Eastern Europe (Scottish Executive, 2007). RDF was introduced in Scotland in November 2002. Between 2005 and 2007 the fund provided £14.4million to help support new air routes, initially to European destinations such as Barcelona, Berlin and Prague. It also helped fund direct flights between Glasgow Airport and Dubai, from Edinburgh to Atlanta, Madrid and Munich, from Aberdeen to Oslo, Brussels and Copenhagen and from Prestwick to Gdansk, Dusseldorf and Pisa. Inverness, Prestwick, Sumburgh and Dundee airports have also benefited from the fund. Investment is paid out retrospectively on the basis of passenger numbers and is available for the first three years of a route commencing.

Northern Ireland was the second area within the UK to adopt the RDF concept and drew heavily on the experience and advice of Scottish Enterprise staff in developing its approach – The Northern Ireland Route Development Fund was initially allocated £4m and implemented in September 2003. The Fund's investment was limited to the first three years of operation of the new routes. Beyond that period it was expected that the routes would be self-supporting. Investment, paid on a per-passenger basis, was limited to load factors of up to 75%. Examples of routes implemented were: Belfast Int'l to New York (introduced 27/05/2005); Belfast Int'l to Paris (15/06/2004); Belfast Int'l to Rome (01/07/2005); Belfast Int'l to Berlin (01/07/2005); Belfast Int'l to Geneva (01/07/2005); Belfast Int'l to Nice (15/06/2004); Belfast City to Norwich (10/02/2005); City of Derry to Birmingham (07/06/2004); City of Derry to Manchester (07/06/2004).

The first English regional fund was launched by the North West Regional Development agency in November 2004. In June 2006, the UK Route Development Fund was established to provide funding for Wales (2 routes) and North East England (5 routes), which commenced activities during the financial year 2006-07.

Under the original protocol RDF offers could be made up to 50% of the cumulative aeronautical and marketing costs. The European Commission published its Guidelines on financing of start up aid to airlines departing from regional airports on 9 December 2005. The main objective of the Guidelines was to regulate the scope, amount and duration of public sector funding relating to start-up of new services, or increasing the frequency of existing services from smaller regional airports. One of the main changes proposed was the reduction in aid support that can be offered from 50% to 30%. The proposed changes came into effect on 1 June 2007. The conditions and restrictions contained in the new RDF protocol makes the scheme unattractive because of the disproportionate work required to obtain a 30% contribution. As a result the Welsh Route Development Fund closed to new services commencing after 31 May 2007. Alternative mechanisms are being considered regarding the continued support for new routes from targeted markets.

Initial assessments of these initiatives suggests they have generated significant benefits, for instance, initial reports suggest that Scotland RDFs have accrued many millions of pounds of economic benefit to the Scottish economy. Also, a report by the CAA (CAA, 2007), which examined long-haul routes, demonstrated that international short haul services from UK regional airports have increased far more than long haul in the last ten years. This provides passengers with an increased ability to travel to hub airports in other EU countries, from which they can connect onto long haul services. For instance, before the introduction of the Route Development Fund most of Scotland's international traffic was routed via other major hub airports, such as Heathrow. Since implementation of the RDF passenger numbers on supported international routes have increased by approximately 168%. However, a case can be put forward for in-depth investigations of the environmental implications of the scheme.

8 THE SCOTTISH EXPERIENCE: AN IN-DEPTH ASSESSMENT

Compared with many other regions in Europe, Scotland is underserved by direct air services. The absence of convenient, direct air services was thought to be inhibiting economic growth in Scotland. In November 2002 the Route Development Fund (RDF) was implemented to generate new direct airline links from Scotland to key UK and overseas destinations and, thereby, expand Scotland's airports as major tourism and business travel gateways.

The evaluation of Scotland's Air Route Development Fund (RDF), which is the primary focus of this paper, calls for a review of the evidence on other support mechanisms to promote the development of additional air services where the

market fails to produce the services which more peripheral areas aspire to in support of wider economic or social inclusion objectives. The review of literature has encompassed an investigation of case study evidence on the mechanisms employed to support air services, methods employed to appraise and evaluate the effects of their use, the scale of support and extent of financial, economic, environmental and social inclusion effects, much of it from other jurisdictions. The study evidence has been drawn in part from a major programme of surveys in Scotland: face-to-face passenger surveys; surveys at retail outlets at airports; airport operations and business staff; and airline surveys.

8.1 Route development in Scotland supported by RDF

From a detailed review of the RDF in Scotland the following was identified:

- Sixty-three services were offered RDF investment, of which 52 services went ahead with 33 of them currently operating either with support or post-support;
- The total number of RDF passengers has grown from approximately 286,000 in 2003/4 to 1.8 million in 2008/9. Since the 2008/9 is partly estimated, it is worth noting the total numbers of passengers in 2007/8 was about 1.9 million;
- Over the above period, there has been a steep rise in the number of domestic and international passengers carried and services operated with RDF investment. This suggests the RDF has instigated a significant increase in passenger levels on Scottish air services. Compared to the annual total for terminating passengers in Scotland (at 25.13 million), the 1.9 million passengers on RDF services in 2007/8 is about 7.6% of the total. The majority of these additional passengers are in international trips serves to emphasise the continued importance of international services in terms of the RDF programme;
- This needs to be set against the background of growing passenger numbers experienced by both Scottish and UK airports, which posted an increase in passengers between 2003 and 2008 of 15.3% and 18.1% respectively (CAA, 2008). However it should be noted that these figures will include passengers on RDF supported flights, both with respect to Scotland and other parts of the UK; and
- Strict criteria must be met before RDF funding is allocated to services. Essentially, a new direct route must be of economic benefit to Scotland and travellers. A full economic appraisal is carried out for each prospective route.

8.2 Economic impacts

A restricted Transport Economic Efficiency (TEE) Appraisal was carried out which yielded estimates of the benefits of the RDF services against the

investment made and additional costs to the public sector. These were restricted to a limited number of benefits (journey time and fare savings) and costs (RDF support and public sector costs, e.g. staff, consultants, etc) in order to measure the gain experienced by the public sector from their RDF contributions.

The analysis showed that nearly all the RDF services return a positive net present value (NPV) and benefit-to-cost ratio (BCR) greater than 1.0 suggesting the RDF programme has been successful in improving travel conditions for business and leisure passengers. In a number of cases, the rate of return is very high. Only 2 services produce negative returns. The total NPV for all RDF services is estimated to be £406 million (at 2002 prices) with a resultant BCR of 23.9, over a 10-year appraisal period.

8.3 Financial impacts

Reflecting the growth in public sector initiatives the amount of support being provided to airlines has increased dramatically. For instance, Table 2 demonstrates an increase in Scottish investment in RDF routes from £902,555 in 2004 to £1,529,832 in 2007. This, in turn, instigated a steady increase in investment per passenger, which peaked in 2006 at £1.53 per passenger. The data suggests a decline in the investment per passenger thereafter, although in the case for 2008 data is only available until May 2008.

Table 2: Comparison of yearly investments per passenger on Scottish RDF Routes ¹

		Total
2003	Passenger numbers	190,429
	Investment (£)	158,360
	Investment per passenger (£)	0.83
2004	Passenger numbers	674,875
	Investment (£)	902,555
	Investment per passenger (£)	1.34
2005	Passenger numbers	1,301,975
	Investment (£)	1,711,023
	Investment per passenger (£)	1.31
2006	Passenger numbers	1,323,506
	Investment (£)	2,025,568
	Investment per passenger (£)	1.53
2007	Passenger numbers	1,183,424
	Investment (£)	1,529,832
	Investment per passenger (£)	1.29
2008	Passenger numbers	177,550
	Investment (£)	209,825
	Investment per passenger (£)	1.18

The financial appraisal examined the wider economic impacts of the RDF services in terms of the additional aggregate Gross Value Added (GVA) to the

economy. The total GVA impact for all RDF services combined has been estimated to be between £47 million and £52 million at 2002 prices, over a 10-year appraisal period.

The level of tourism expenditure was obtained from the passenger surveys undertaken at different airports. The results indicated that the expenditure by Scottish tourists outside Scotland for 2008 was approximately £156.3 million. Likewise the expenditure for non-Scottish tourists gave a value of approximately £176.2 million in 2008. Scottish tourism spend in non-Scottish destinations, represents leakage to the Scottish economy. The difference between these two values, £19.9 million, represents the estimated net additional tourist expenditure accruing to the Scottish economy in 2008 as a result of the implementation of the RDF supported air services.

Business expenditure was estimated in a similar way to that tourism above. However, the length of business stays for both non-Scottish business trips in Scotland and Scottish business trips elsewhere were very much shorter than those for tourists for the respective direction. In addition, businesses tended to make repeat visits to Scotland. For a high proportion of non-Scottish and Scottish businesses these amounted to multiple visits. Business trip expenditure was taken from surveys with business passengers using the RDF supported surveys. Taking into account both deadweight and leakage, the additional net expenditure in Scotland is estimated at £7.8 million in 2008.

8.4 Social impacts

The RDF services in Scotland are on average 62% faster than comparable surface journeys and also 24% shorter in distance travelled. This suggests there are likely to be social inclusion benefits experienced by users of these RDF services. These benefits include reducing the perceptions of the remoteness of parts of Scotland (especially rural areas and the islands). Feedback from passenger and airline surveys suggested that the perceptions of the RDF services are of in-filling and connecting parts of the country which were previously difficult to reach directly and that these perceptions are considered important by users.

User interviews on RDF services were carried out, during which passengers were asked for their purpose of travel and about their background and circumstances. These were used to estimate the proportions of those interviewed who travelled to educational establishments or those unemployed looking to access work. Applying these rates to the annual passenger totals for the relevant RDF services, it is possible to estimate the numbers of passengers who have travelled in 2008 for enhancing their education or employment prospects.

In terms of overseas-based people coming to Scotland to work and support their families back home, the surveys considered migrant workers who use the RDF services for exactly those reasons. The results have suggested that migrant workers accounted for about 3.2% of total passengers in 2008.

In addition to providing direct monetised benefits, the surveys asked key stakeholders such as airports and airlines whether there has been any increase in job numbers during the RDF programme period. The interviews identified the total net increase in job numbers during the period of the RDF was 37 full time equivalents (FTEs).

A summary of impacts are shown in Table 3.

Table 3: Summary of Social Inclusion Impacts

Sector	Summary of Impacts	
	Gainers	Losers
Improved Journey Times	RDF services are on average 62% faster than comparison surface modes. Helped reduced perceptions of remoteness.	No significant effects.
Access to Education	51 passengers in 2008 used RDF services for education.	No significant effects.
Helping the Unemployed and Others (e.g. Migrant Workers)	13 passengers in 2008 used RDF services for education. Also, 3.2% of total passengers in 2008 were Migrant Workers.	No significant effects.
Visiting Friends and Families	Strong correlation between areas served by Inverness and Aberdeen airports and the extent of visiting friends and relatives.	No significant effects.

8.5 Environmental impacts

While the RDF services have produced positive impacts to the economy they have also increased the number of flights and hence the amount of air pollution and emissions. In particular, the appraisal considered the implications of the RDF programme on climate change, by estimating the amount of tons of Carbon Dioxide (CO₂) emissions from the services. The analysis suggests the CO₂ emissions from the RDF services were just under 4.02m tons over a 10-year appraisal period. This is equal to £69m discounted to 2002 prices to match the same price base as the TEE Appraisal calculations.

It could also be argued that while there is an increase in CO₂ emissions due to the RDF services, there could also be a reduction in emissions from other modes (e.g. car and ferry) which would have been used in the absence of the RDF services as some people would still travel using these alternative modes. Furthermore, some people may still have travelled by air using two flights and

changed at a hub airport. Hence, it could be argued that the emission estimates presented here are higher than what has actually been generated.

8.6 Overall assessment

The above findings point towards a mixture of results:

- Impacts of the RDF services are potentially significant in terms of the additional trips brought about. RDF services now account for over 7% of the Scottish total number of air trips;
- RDF services have in-filled previous gaps in the network and are benefiting travellers for a variety of purposes;
- there have been significant economic and social benefits arising from the RDF services, including increased tourism and business spend in Scotland;
- There have also been some modest social inclusion benefits, particularly in the remote and rural parts of the country. Journey time savings have been significantly high compared to alternative surface-based transport; and
- With the increase in the number of flights there has been an increase in the amount of air pollution emissions. However, it could also be argued that while there is an increase in emissions due to the RDF services, there could also be a reduction in emissions from other modes (e.g. car and ferry) which would have been used in the absence of the RDF services as some people would still travel using these alternative modes.

9 SUSTAINABILITY OF RDF SUPPORTED SERVICES

In the case of the Route Development Fund the sustainability of services supported by this mechanism offers some potentially useful insights into maximising the effectiveness of such interventions.

Table 4: Number and Sustainability of RDF routes (CAA, 2007)

Country		Total	Still operating	Withdrawn RDF supported services	
				N	%
Scotland	Domestic	13	11	2	15.4
	International	48	33	15 ²	31.3
	Total	61	44	17	27.9
Northern Ireland	Domestic	3	0	3	100.0
	International	6	4	2	33.3
	Total	9	4	5	55.6
Wales	Domestic	1	0	1	100.0
	International	4	2	2	50.0
	Total	5	2	3	60.0
North East UK	Domestic	1	0	1	100.0
	International	5	4	1	20.0
	Total	6	4	2	33.3
UK total		81	54	27	33.3

The level of withdrawal ranges from approximately a third of the services (Scotland and North East UK), to approximately two thirds of the service (Northern Ireland and Wales). Only 5 of the original routes that were implemented in 2003 have been withdrawn, similarly only 4 routes were withdrawn in 2005, whereas 18 routes, which were implemented in 2004 (9 routes) and 2006 (9 routes), have been closed down.

Overall, the Scottish performance in establishing successful new services is markedly better than other areas of the UK. The least sustainable routes appear to be non-Scottish originating domestic flights. It can be argued that this pattern of performance may reflect a combination of more favourable circumstances but not least the energy, drive and resources committed by key stakeholders in Scotland.

10 DISCUSSION

10.1 Reconciling economic and social requirements

The evidence suggests that the Route Development Fund (RDF) has significantly increased passenger flows; successfully improved travel conditions for business and leisure passengers; increased the total Gross Value Added (GVA) impact to the wider Scottish economy; resulted in an increase in tourism and jobs; and provided a vital tool for some social inclusion impacts in rural areas. A series of passenger and operator surveys has suggested that nearly two-thirds of the non-Scottish businesses interviewed see the RDF services they use as instrumental in maintaining connectivity and competitiveness in Scotland. The importance of RDF flights to business connectivity seems to be reinforced where nearly three-quarters of non-Scottish businesses stated that the RDF supported flights have

reduced the feeling that Scotland is remote from the centres of business activity. The social inclusion benefits experienced by users of these RDF services include reducing the perceptions of the remoteness of parts of Scotland (especially rural areas and the islands).

A lack of planning and poor information may ultimately lead to question marks being raised over the credibility and usefulness of specific incentives and even their potential abuse in some cases. Weatherhill (Weatherill, 2006) from a North American perspective has proposed a 5-point check list for introducing incentives:

- Create an Air Service Development strategy to identify viable services.
- Determine whether financial incentives are appropriate to qualify for financial support.
- Establish the proper type and level of airline incentive.
- Coordinate support and securing funding for the incentive, e.g. from the airport, government bodies, etc.
- Negotiate a balanced agreement in support the service.

10.2 Environment or socially necessary flights?

A balance has to be established between the need for flights and the needs of the environment. It is well known that an increase in flights produces an increase in the amount of air pollution emissions. When government bodies are of mind to reduce flights to improve the impact of air transport on the environment it is necessary that the outcome of their assessment of these routes is highly dependent on the allocation of the price of carbon. So it is vital that they ensure that the correct price is allocated and that the benefits that these flights bring.

To estimate the implications of the RDF programme for climate change a Carbon Dioxide (CO₂) emissions appraisal was undertaken to identify the extent of emissions attributable to RDF services, this was estimated to be just under 4.02m tons over a 10-year appraisal period. Based on UK Government shadow prices for carbon this was valued at £69m discounted to 2002 prices. The evaluation of the RDF scheme as applied in Scotland indicates that the economic benefits to this peripheral area significantly outweigh the public costs incurred by the scheme including those attributed to CO₂ emissions.

Although this provides support for RDF funding considerable controversy surrounds the valuation of carbon. Department for Environment, Farming and Rural Affairs (DEFRA) has developed monetary values for carbon up to 2060 these provide the basis for the foregoing estimates of climate change related costs. However, alternative values can be derived from work on carbon credits and taxes, as well as carbon trading schemes. On the basis of work

undertaken by Hope for the UK Government he has argued for a figure of £85 per tonne rising of 2-3 per cent per year.

The analysis of the CO₂ emissions was rerun, by the authors of this paper, this time applying Hope's recommendations on carbon pricing. The results yielded an increased value for CO₂ emissions of £276 million. Notwithstanding this significantly inflated valuation for carbon (up by 300% on current assumptions) the conclusion concerning the efficacy of the RDF scheme remains robust. However, this implicitly assumes application of a shadow price rather than introduction of a carbon tax on air services. Of course this does not take into account the likely impact on fares and thus the market for such services if such a carbon tax at this level was applied to air travel. Pressures to introduce such measures are likely to be a source of continuing controversy, particularly where they impact on more remote regions and countries.

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NOTES

¹Figures were obtained from Avia Solutions Limited, July 2008

²Of which 2 never operated, 5 the airline ceased trading, 8 were withdrawn.