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Summary

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The current environmental situation and proposals for the management of the Fildes Peninsula Region

Summary

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Protection of the Antarctic
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The Antarctic is still a relatively unspoiled continent with unique biological, geological and hydrological features. However, some Antarctic regions have been increasingly exposed to a multitude of human impacts that have already had a considerable impact. The **Fildes Region** (King George Island, South Shetland Islands), comprising the Fildes Peninsula and neighbouring Ardley Island, are part of the largest ice-free areas in the maritime Antarctic region and are characterised by comparatively **high biodiversity**. At the same time, this area constitutes the **logistical hub of the northern Antarctic Peninsula**, with six scientific stations that operate year-round and a runway. Diverse activities in the fields of research and logistics, but also tourism, regularly overlap in space and time. This array of activities leads increasingly to **conflicts between the various user groups and the nature conservation and environmental protection** measures contained in the Protocol on Environmental Protection to the Antarctic Treaty (EP). Because the extent to which regulations under the EP have been enforced has varied greatly between the stations of the Fildes Peninsula and management measures to date have only partly addressed the complexity of human activities, there is a great need for research into the Fildes Region. Within the context of the German environmental research project, "Risk Assessment for the Fildes Peninsula and Ardley Island, and development of management plans for their designation as Specially Protected or Specially Managed Areas" (FKZ 203 13 124), carried out between 2003 and 2006, the scientific basis was laid for the discussion process regarding essential management measures. This involved monitoring seabirds and seals, and recording anthropogenic activities and their impact on the local environment. In addition, there was an assessment of assets to be protected, in the context of a **risk analysis**. Specific **management proposals** were drawn up, taking account of management practices to date and based on the data collected. Designation of the area as an Antarctic Specially Managed Area (ASMA) was proposed as the best option for improving coordination and cooperation. The decision on whether an area is designated as an ASMA is made by the Antarctic Treaty Parties at their annual meeting (ATCM). The international working group (IWG) specially set up for the Fildes Region within the CEP (Antarctic Treaty Committee for Environmental Protection) is charged with developing a management system for the various user groups (*e.g.* research, logistics, tourism) in the Fildes Region. Both the ASMA designation process and the introduction of alternative management measures proved to be protracted. **The aim of the current study** was to continue research into the environmental state of the region, so as to be able to make statements about changes and trends in the Fildes Region and thus keep the scientific basis for the designation of the area up to date and usable during the discussion process at an international level (ATCM).

Between 2008/09 and 2011/12 **population figures** were obtained and GPS/GIS-supported **distribution maps** drawn up[1] for all **species of breeding birds**. This included the first evidence of light-mantled sooty albatrosses breeding in the Fildes Region. Repeated sightings of light-mantled sooty albatrosses as early as the 1980s led researchers to suspect the presence of a brood on the cliffs of Flat Top Peninsula, without being able to substantiate it. Five nests were clearly identified and photographed in the 2008/09 season, and one nest in 20011/12. This new colony is located approximately 1,520 km southwest of the nearest known nesting site on South Georgia. It is thus the most southerly breeding colony of albatross in the world.

[1] In this summary of the comprehensive final report, sources are omitted. A detailed description of the methodology used can be found in the report from the previous project (Peter et al. 2008 : Risk assessment for the Fildes Peninsula and Ardley Island, and development of management plans for their designation as Specially Protected or Specially Managed Areas. Research Report 203 13 124 Federal Environment Agency - texts).

Current breeding pair numbers for the three penguin species that breed on Ardley Island confirm the trend that has been observed in the population development of this colony. Despite sharp fluctuations, we can observe an increase in numbers of gentoo penguins and a decrease in the Adélie and chinstrap penguin populations. The number of breeding gentoo penguins, at 5,761 breeding pairs (BP) in the 2011/12 season, reached the highest level since continuous data collection began. Despite sharp annual fluctuations, populations of chinstrap penguins *(Pygoscelis antarctica)* and Adélie penguins *(P. adeliae)* continued to decline. Thus, the lowest numbers of breeding pairs so far were recorded (*P. antarctica*: 8 BP in 2007/08 and 2008/09, *P. adeliae*: 307 BP in 2009/10). However, the populations of these two species now appear to have settled at a consistently low level. Similar population developments have been observed in other colonies in the Antarctic Peninsula region. This trend is linked to the continuing warming of the climate and the associated reduction in winter sea ice expansion, which is itself connected with the development of krill, the main food source for Adélie penguins.

The southern giant petrel (*Macronectes giganteus*) is considered to be especially sensitive to disturbance and thus plays a particularly important role as an indicator of anthropogenic disturbance. After moving their nesting sites due to construction of several stations in the 1980s, populations of these birds in the Fildes Region have recovered in recent years on islands far from research stations. However, breeding success (number of fledglings per brood started) of the southern giant petrel, at 0.41 ± 0.08 (2002/03-2005/06) or 0.33 ± 0.14, was still significantly below the level in the 1980s (0.58 ± 0.11, 1979/80, 1983/84 and 1984/85). In total, between 225 and 407 BP bred in the Fildes Region. The strong fluctuations in BP numbers and in breeding success cannot be explained by natural factors but are probably the result of direct disturbance by station members. Changes in the breeding pair populations of some colonies indicate renewed transfers of nesting sites to more distant or more inaccessible places, which are therefore undisturbed. A positive factor to mention is that the number of extremely low flights outside the usual approach route to the runway, which can cause southern giant petrel to leave their nests, has declined sharply in the last few years. During the research period, no such low flights were observed over Fildes Strait, in contrast to Ardley Island. They can therefore presumably be ruled out as a possible cause of the negative population development in the southern Fildes Region. In addition, increased attempts to breed were recorded in some areas that had not been used for years, although the success of the broods started there has so far been limited.

The skua population in the Fildes Region fluctuated between 197 and 357 breeding pairs per season and was thus average over the long term. The number of breeding cape petrels (*Daption capense*), ranging from 191 to 262 BP, was significantly lower than in the period from 2003 to 2006. The same is true of the kelp gull (*Larus dominicanus*), of which between 50 and 127 BP were recorded. However, these populations were considered to be stable and the fluctuations are probably due to natural causes. In contrast, no significant population changes were found for the Antarctic tern (*Sterna vittata*). One to two breeding pairs of snowy sheathbill (*Chionis alba*) were recorded in each season. Additional data were collected on the distribution of Wilson's storm petrels (*Oceanites oceanicus*) and black-bellied storm petrels (*Fregetta tropica*). Moreover, distributions maps were compiled for all migrants and visitors. During the research period a total of 38 different bird species, of which 13 breeding species, were recorded in the region.

The seal population in the summer months was established with the help of monthly **seal counts** along the coastline of the Fildes Peninsula and Ardley Island. Most frequently recorded

were southern elephant seals (*Mirounga leonina*), with a maximum of 1,383 individuals, followed by Antarctic fur seals (*Arctocephalus gazella*), with a maximum of 1,061 individuals, and Weddell seals (*Leptonychotes weddelli*), with at most 123 individuals. Much rarer, with a maximum of two individuals each, were crabeater seals (*Lobodon carcinophagus*) and leopard seals (*Hydrurga leptonyx*). Reproduction data for the five seal species mentioned are also available. These showed an **expansion of Antarctic fur seal pupping places** towards the south, including Ardley Island.

Many incidences of **damage to vegetation** were documented, caused mainly by vehicles being driven outside the road network or by construction activities and the associated quarrying of building materials. The spread of Antarctic hair grass (*Deschampsia antarctica*) in the Fildes Region was again demonstrated using distribution maps, with the help of data obtained by an international student expedition in the 2007/08 season. Nevertheless, this spread has also been reversed at some sites, which could be due to habitat destruction as a result of construction activity or general degradation through treading and other causes in the vicinity of stations.

A specimen of an **introduced grass species** (Poaceae), which could not be identified, was discovered in the immediate vicinity of the Russian station Bellingshausen in December 2008. In line with current recommendations, it was documented and removed. A **non-native insect** found around 3 km from the nearest station in December 2011 could be a mosquito of the species *Trichocera maculipennis*, which has been found in the wastewater treatment system and the surroundings of the Uruguayan station Artigas. Members of various stations also reported repeated sightings of flies (Diptera) and moth-like Lepidoptera. These were probably brought by sea in deliveries of food or building materials. People still commonly keep house plants in a number of stations, in violation of existing guidelines. Recent studies have shown that the risk of participants in National Antarctic Programmes introducing alien species is particularly high. The various stations of the Fildes Peninsula currently take either no measures or only limited measures to prevent the introduction of non-native species. Moreover, to our knowledge, no measures have been implemented to monitor non-native species.

During the research period, the management plans of the two **protected areas** in the Fildes Region, the Antarctic Specially Protected Area **(ASPA) No. 125 Fildes Peninsula and ASPA No. 150 Ardley Island**, were revised by Chile, which based its revisions mainly on our project data. ASPA No. 125 was divided into a total of eight sections, while the visitor zone on the north-eastern coast of Ardley Island was excluded from ASPA No. 150. Numerous **violations of the management plan regulations** of both ASPAs were recorded during the research period (see below). In addition to the officially designated **Historic Sites and Monuments (HSM)**, the Fildes Region also contains a large number of **historic artefacts from the whaling and seal-hunting times of the 1820s**, which so far have no protected status and are therefore at risk of unintentional damage or destruction. All published data on this subject were collated and further objects with potential historical relevance were mentioned. Despite the designation and recognition of the HSMs and ASPAs of the Fildes Region at international level, there are clear shortcomings in knowledge at the stations in the area of the protected areas and of the guidelines relating to the management plans. The aim of having this information available through the display of the plans at the stations is currently not being fulfilled, as not all stations had current versions of the management plans for ASPA No. 125 and No. 150 at their disposal.

In the Fildes Region there are currently six **scientific stations**, which are occupied year-round and are to a great extent independent of one another, together with one airport. In addition,

there are seven **field huts**, which are not regularly used but which, to a greater or lesser extent, are made available to scientists and other station members. All substantial **changes to stations and their infrastructure** were documented as far as was possible. For example, the Chilean naval base is now occupied all year round and is described by COMNAP as an independent station under the name Estación marítima Antártica. As a result of this development and following extensions to other stations, the average number of people living and working in the stations rose from 251 to 316 in the summer season (a 26% rise) and from 95 to 126 in winter (a 33% rise) between 2005/06 and 2011/12.

Since 2006 there has been **construction work** at all stations on the Fildes Peninsula to **extend** them or to **improve infrastructure**. These construction activities were monitored as to potential **environmental effects** and important observations were documented. It is positive to note that at several stations new wastewater treatment facilities were built and old fuel tanks and pipelines were replaced, which significantly reduced the risk of environmental contamination. In contrast, some activities with very negative effects on the environment were recorded, which were often not preceded by an Environmental Impact Assessment (EIA). For example, nesting areas of terns, skuas and kelp gulls were negatively affected by **noise** from construction work during the breeding season, and resting seals were also disturbed. Furthermore, nesting sites of terns were considerably damaged, and in some cases completely destroyed, by the **removal of substantial amounts of sand and gravel** for use in construction. Large areas of dense vegetation were also destroyed and several beach ridges of palaeontological significance were completely removed, which represents a considerable loss to science. The affected area covers more than 5 ha. The construction work involved in station extensions also led to a considerable amount of **waste entering the environment** due to the open and unsecured storage of large amounts of building and packaging materials, and continuous **oil contamination** of all areas where construction vehicles were driven. On many occasions, researchers also observed **violations by station members of existing behavioural guidelines**. Further construction projects are planned, including an extension of the existing runway, and the environmental impact of such projects should also be documented. Taken as a whole, the significant improvements to living and working conditions, and the reduced risk of oil contamination, contrast with a multitude of negative effects on the environment.

The **condition** and **use** of all previously described **field huts**, as well as two new ones, were documented. The majority of field huts are in good condition, with some having been renovated, and they provide scientists, who are the main users, with good accommodation. However, the mould infestations inside the huts, which are sometimes severe, present a serious health risk to visitors in the case of longer stays. A Russian field hut in the north of the Fildes Peninsula plays a particular role, as it is regularly visited by station members and used annually by a fairly large international group of visitors. The majority of leisure excursions still involved the use of motor vehicles, which in some cases caused substantial damage to vegetation. Around three-quarters of leisure visits to huts occur between December and March. As a result there is a strong risk of disturbing breeding colonies of southern giant petrels that are in the immediate vicinity, as well as pupping places of Antarctic fur seals. In addition, there are a number of huts in the area that have completely collapsed, leading to the spread of anthropogenic materials into the surrounding area.

As a result of construction work at the stations, the **number of buildings** and other relevant installations in the Fildes Region has risen from 159 to 187 since 2006. The total built-up area has increased by around a fifth since 2006 to at least 23,000 m^2.

Based on the results obtained in the years 2003-2006, all relevant changes to the waste situation in the Fildes Region and to waste management by the stations based there were recorded. Alongside deficiencies in **waste management at some stations** of the Fildes Peninsula, some of which have existed for a number of years, there are diverse improvements, such as the removal from the region of a large amount of scrap metal and building rubble. For the first time, however, it was demonstrated that the Fildes Region is directly influenced – albeit to a limited extent – by the current waste management practices of other stations, ships and yachts on King George Island. The existing data set for **old waste dumps** was expanded by four further dumps, which had become increasingly recognisable over recent years as a result of continuing cryoturbation and solifluction. The total surface area of all known waste dumps in the Fildes Region, some of which are located very near to – or actually inside – protected areas (ASPA No. 125 and ASPA No. 150) rose to approximately 51,000 m^2, an increase of some 23%. At the majority of these dumps, objects classified as hazardous waste were found, such as batteries, medicines, containers with remains of chemicals, oil barrels, and oily vehicle parts. Some of these areas were superficially cleared of larger objects. The proven existence of three **active waste dumps** totalling approximately 5,200 m^2 and the fact that **waste is still occasionally burnt in the open** can be put down to deficiencies in the waste management practices of certain stations. Such practices are clearly inconsistent with currently applicable regulations.

Updated mapping of **waste distribution** showed that waste, including hazardous material, is still entering the environment. The majority of the 220 waste findings had been dispersed by the wind. The unusually high concentration of new waste present in the environment in the south and south-west of the Fildes Region was a result of the open storage of light materials easily dispersed by the wind. Polystyrene, which according to the Environmental Protocol may not be introduced into the Antarctic environment, is common all over the Fildes Region. The circumstances in which some of the findings were discovered indicate that the material was actively brought to the sites and dumped there. However, the main causes for the spread of waste in the Fildes Region are the insufficient securing of packaging or insulation materials during logistical operations, and the decay of buildings or other facilities.

Despite repeated educational training by project members on the ground, skuas continued to be fed at all stations on the Fildes Peninsula, or organic waste, including poultry, was disposed of in such a way that it was easily accessible to skuas. These practices bring with them risks such as the introduction of diseases or the negative consequences for chick growth of food that is not typical for skuas and is often of lower quality.

Alongside minor changes to drinking water supplies, new **wastewater purification** facilities were installed in a number of stations. As a result, since a short time ago, all stations of the Fildes Peninsula have such facilities, though their technical standards vary greatly. Observations made at the discharge points of treated wastewater, such as a strong smell, noticeable colouring of the water, a build-up of foam and increased algae growth, indicate a clear need for improvement. In the airport area as a whole, the point of discharge of wastewater into the nearby stream or into the soil presents a problem as, contrary to EP requirements, it does not guarantee either a rapid initial dilution in the sea or a rapid dispersal of the wastewater. This could lead, for example, to a rise in nutrient levels that would cause increased

algae growth. It is also a continuing cause for concern that the treated wastewater is discharged into the soil or into a stream, as this does not guarantee a rapid initial dilution and dispersal in the sea. Comprehensive and continual wastewater monitoring in all stations is essential for ensuring the efficiency of water purification systems and thus preventing the introduction of additional nutrients, harmful substances and non-native microorganisms into the environment through station wastewater.

Oil contamination is one of the most common causes of local contamination in the Fildes Region and it was recorded in the form of visible traces on the soil and water surfaces. The situation found in the study area indicates that contamination of the Fildes Peninsula by oil and diesel fuel is undiminished. Particularly affected are places where aircraft and motor vehicles are filled with fuel, places where fuel is stored, and the road network that links the stations and the airport. The cause of numerous, mostly small patches of contamination is the frequently occurring oil loss due to insufficient maintenance of vehicles used by the stations, together with a lack of care when handling fuel. In addition, the repeated transfer of fuel between various supply and daily service tanks increases the risk of oil contamination. During the research period, there was at least one **major leak of diesel fuel** (approx. 3,000 to 5,000 l) from a storage tank, which was comparable to an incident in 2005. Measures taken in response to the leak were slow in coming and were completely inadequate, so that a large amount of the fuel entered the nearby cove. The oil film that was clearly visible throughout the summer also stretched near to the coast of ASPA No. 150 Ardley Island, where there is a large penguin colony. The following summer, meltwater again carried fuel into the sea, though to a smaller extent. The measures taken against this again had little effect.

In contrast to the continuing oil contamination, there have been some **improvements in fuel management**. Fuel transport was either carried out using more appropriate vehicles or made completely unnecessary by the installation of new tanks or pipelines.

The existing overview of the sources of noise and gaseous emissions was updated. The use of new airplanes and the reduction in low-level overflights contributed considerably to reducing overall noise from flights. In contrast, vehicle use increased significantly on the Fildes Peninsula, for example due to construction work in connection with station extensions and increased use of four-wheel motorcycles (quad bikes). Greater use of quad bikes significantly increases the risk of disturbing breeding birds or resting seals.

As regards **air traffic** in the Fildes Region, no further increase in the number of days with flight activity could be established, compared with the previous project. Smaller airplanes of various types were recorded most frequently in the region. The number of flights by Hercules C-130-type aircraft fluctuated comparatively strongly during the seasons studied. These aircraft are mainly used to transport supplies, construction material and station members for different stations on King George Island. The number of days with helicopter flights declined as a whole over the seven seasons studied, though as a rule helicopters complete numerous flights on days when they are used, in particular for unloading. The proportion of local air traffic represented by helicopters belonging to stations was high, just as before.

Flights by a private Chilean company, which predominantly carries out tourist flights but also transports scientists and station staff, make up a large proportion of flight days and have increased significantly over the last few years. In contrast, tourism-motivated overflights by passenger jets no longer took place.

In the 2009/10 season, a TLS landing support system was installed at the local airport to reduce the dependency of all take-offs and landings on locally-prevailing weather and visibility conditions. However, this system has so far been used only rarely due to technical problems. The consequence was that, even after the introduction of the system, there was still an accumulation of flights in the Fildes Region on days with good weather. This meant that on occasion up to eight different aircraft a day were flown. Such peaks in activity are mostly closely related to ship traffic in Maxwell Bay and are often connected with numerous flights of ships' helicopters.

As observed in 2003-2006, there were repeated overflights over Ardley Island in the 2008/09 to 2011/12 seasons, in which the mandatory minimum distances of 610 m (vertical) and 460 m (horizontal) to bird colonies were not complied with. Here, both station and ships' helicopters were involved, as well as smaller (two engine) and large (four engine) airplanes of the types Twin Otter and Hercules C-130. Compared to the very large number of overflights over Ardley Island in the past, violations of flight distances declined significantly. This noticeable decline in violations of the horizontal and vertical flight distances to Ardley Island is possibly directly related to increased awareness on the part of the pilots and those responsible for the flights of the need to protect ASPA No. 150 and its assets. Furthermore, In contrast to the previous project period, there were no overflights over the Fildes Strait or helicopter landings outside regular landing sites or outside the airport.

Records of **ship traffic** showed that it has remained at consistently high levels in recent years. National supply and patrol ships form the largest share of this traffic, with up to 72% of ship arrivals in Maxwell Bay. Noteworthy was the large increase in the number of days with more than one ship mooring in Maxwell Bay. This increase in ship traffic is closely connected with logistical and tourist flight activities, which are greatly dependent on local weather conditions and are often accompanied by intensive airplane, helicopter and zodiac traffic. Because this increase in ship traffic is regularly accompanied by a multitude of flights and various other activities (visits by ship crews and tourists to stations and their surroundings, freight unloading and transport, partly with heavy vehicles), we should expect negative effects on the environment. Our observations that ship crews and tourists of supply vessels not only caused increased noise emission in the surroundings of the stations and in the flight areas, but were also responsible for repeated direct disturbance of resting seals and penguins, agree with observations in other Antarctic regions. It is to be expected that there will be cumulative effects on the environment, at least in the surroundings of the stations.

The increase in the number of cruise ships arriving at Maxwell Bay observed in the period 2003 to 2006 did not continue in the research period. However, there has been a significant increase in transfers of passengers from cruise ships and yachts to air travel. While there was only one exchange with a yacht during 2003/04, there were nine exchanges with cruise ships and four with yachts in 2011/12. Whereas there were a total of five arrivals combined with a cruise passenger transfer in the 2003/04 and 2005/06 seasons, there were more than five times as many arrivals, with a total of 28 such combinations, in the last four seasons. According to IAATO, the number of such passengers rose from 345 to 860 between the 2009/10 and 2011/12 seasons alone, which is a jump of some 150%. A further substantial rise is forecast, to four companies and more than 2,000 passengers.

Between two and six yachts sailed to Maxwell Bay in every season to visit the stations of the region, for example, or to let passengers fly in or out. In the case of one yacht, deficiencies in waste management were found which had a local impact. It is not yet known what

environmental effects were caused by the sinking of a yacht in Maxwell Bay in April 2012. According to the published report on the incident, the yacht, which had around 8,000 litres of fuel on board when it scuppered, will be salvaged during the next Antarctic summer.

In almost all stations on the Fildes Peninsula, the vehicle fleet has considerably expanded in comparison to the last known figures from 2006. This includes cars as well as larger construction vehicles and towing vehicles. There was an evident lack of maintenance on several of these construction vehicles, causing a continuous oil loss during the entire study period. Increased use of quad bikes outside the existing road network caused damage to vegetation and poses a high risk of disturbing breeding birds. The records of all vehicle tracks made after 2006 illustrate clearly the high risk of damage by vehicle traffic outside the existing road network, because driving just once over the sensitive vegetation can cause damage that requires decades to regenerate. The vehicle tracks were caused above all by the leisure activities of station staff and construction activities. The prime destinations for motorised leisure outings were clearly scenically attractive areas. However, scientists also preferred to visit their research sites using vehicles, even when the sites were within walking distance of the station. According to the existing guidelines for protecting ASPAs No. 125 and No. 150, driving on these areas is strictly prohibited. These ASPA regulations were, however, repeatedly massively violated. Both Ardley Island and the peripheral area of the Collins Glacier and Fossil Hill were repeatedly travelled on with four-wheel-drive and other vehicles.

Research in the Antarctic is of the greatest importance for understanding climatic and ecological relationships. Nevertheless, it must be carefully weighed against its negative effects and those of the supporting logistics. To minimise negative effects of research on the environment, SCAR (Scientific Committee of Antarctic Research) recommends behavioural guidelines for **scientific activities**, in order to guarantee a certain standard for the topics to be investigated and the methods to be applied. In practice, however, there are large individual differences in the realisation of projects. For instance, scientists of different nations were insufficiently informed about the subjects of their research and the study area. Experimental equipment in the field is often so poorly constructed that it does not survive the raw Antarctic conditions. Equally, once projects are finished, there is a lack of an orderly dismantling and disposal of all markings and equipment. For example, numerous remains of scientific experimental equipment can be found over the entire Fildes Peninsula and the neighbouring Collins Glacier area. The labelling recommended by SCAR for experimental equipment left in the field has so far either not been implemented or has only partially been introduced, so that unambiguous identification is often not possible. The availability of information about current or planned projects at the level of the accomplishing scientists is likewise far from sufficient to ensure proper coordination between different projects in the same area. Overlapping of projects in time and space can affect results and can cause increased disturbance to flora and fauna. In the study area, researchers are working on a wide spectrum of scientific topics. However, it seems that the scientific potential of most stations has not yet been exhausted, as it is still common practice for neighbouring stations to routinely collect similar, or even identical, data. This duplication of data collection should be scrutinised and the relevant projects should be made more efficient.

The **spectrum of tourist activities** covers visits by tourists in the strict sense of the word, including passengers and crews of ships and airplanes, together with leisure outings by station members (station staff and scientists), film crews and teams of journalists, and, increasingly, government delegations. The education programmes that have been increasingly conducted

during the past few years, *e.g.* for groups of schoolchildren, represent a borderline case. However, in our experience, they can best be classified under tourism, as they are sometimes insufficiently prepared and have the characteristics of excursions. Tourism proper in the Fildes Region still takes place mainly in the form of organised ship and air tourism or a combination of the two. So far, hardly any direct negative effects could be observed on the Fildes Peninsula resulting from these forms of tourism, as such visitors only enter specially defined areas and are accompanied by expert guides. The numbers of passengers landing from cruise ships did not increase in comparison with the 2003-2006 period and such landings were often in connection with evacuations due to medical emergencies, for example. Although no precise data are available on the subject, it can be assumed that the number of passengers with the Chilean Aerovías DAP company will also increase. The company offers both day trips and trips lasting several days in the Fildes Region. The National Antarctic Programmes support tourist activities to some extent, providing logistical support and accommodation, for example.

Of particular note was the **ignorance** of **behavioural guidelines** in the Antarctic shown in some cases by crew members of supply ships and yachts. A special case is clearly that of unaccompanied tourists travelling on supply or patrol ships, who were in some instances seen to infringe rules of behaviour. The Fildes Region is also frequently visited by film crews and other groups of journalists, who in many cases have insufficient knowledge of the behavioural guidelines that apply in the Antarctic.

Since 1995, marathons and half-marathons have regularly been held on the Fildes Peninsula. Two such races were comprehensively documented during the research period. Almost the entire route followed the existing road network. In addition, the races took place either at the end of the breeding season or after it had finished. There was also no evidence of damage to scientific projects. Altogether, the effects of the marathons on the region could be regarded as limited and very local.

The **leisure behaviour of station members** plays an important role with regard to potential negative effects on flora and fauna, as a representative survey of station staff and scientists revealed that they spend a considerable part of their leisure time in the open. Station members overwhelmingly use the existing road network for walks. However, in the coastal area between the Ardley Isthmus and Great Wall Station, and on the Drake Coast, we frequently observed definite disturbance of resting seals and penguins by visitors, due to the proximity to the coast. Particularly popular are visits to the penguin colony of ASPA No. 150 Ardley Island and motorised excursions, sometimes by quite large groups of people, to a field hut located in the north of the Fildes Peninsula. Fishing and collecting fossils and minerals represent further leisure activities. Furthermore, there are photographs known on which station members can be seen immediately in front of southern giant petrel nests or touching seals and penguins, as well as catching skuas. Such pictures clearly demonstrate the frequent lack of awareness of station members (including scientists) with regard to disturbing animals or to damaging the local vegetation. Management plans for both ASPAs were frequently either not known by station members, were not available in some stations, or clearly met with little interest. When questioned, scientists and even seasoned overwinterers demonstrated a lack of appropriate training or education.

According to the management plans for ASPAs No. 125 and No. 150, which came into force in 2009, these areas may only be entered in connection with management measures or for scientific objectives, with the appropriate permit from the national competent authorities. Nevertheless, these areas were frequently visited by members of virtually all stations, often

without any scientific motive (see above). This led repeatedly to disturbance of breeding southern giant petrels, penguins, skuas and terns, as well as damage to vegetation by walkers or vehicles. Vehicle use documented in ASPA No. 125 and 150 represents a further serious **violation of the protected area regulations** and was documented during several seasons. Parts of ASPA No. 150 Ardley Island were noticeably affected by the presence of large amounts of rubbish in the environment, which was the result of waste being dumped in the open. In contrast, the number of low overflights in this protected area decreased significantly. A serious infringement of the regulations is the deliberate collecting of fossils and minerals for private purposes in ASPA No. 125 Fildes Peninsula.

All in all, the increasing pressure of visitor numbers also increases the potential negative impact on the flora and fauna of the Fildes Region. In general, though, the effects resulting from organised tourism are considerably more limited than those caused by station logistics and staff.

Based on the new investigations, the **risk analysis** drawn up as a result of the previous project was updated. The new findings to a great extent confirmed the earlier assessment. Thus, station operations, traffic, visitor behaviour, scientific activities, and the introduction of non-native organisms represent the most important sources of anthropogenic disturbance and the greatest threats posed by humans in the Fildes Region. In summary, the potential risk posed by current human activities in the Fildes Region, which is high as a whole, has increased moderately in comparison to previous assessments. Based on the total number of human activities in this region and the current upward trend, a significant increase is to be expected in the negative anthropogenic environmental impact, so long as no management geared towards this region is implemented and no appropriate and effective monitoring mechanisms are in place.

The report contains specific **management proposals** based on management practices to date and the deficiencies that have been documented. The measures proposed can substantially improve the current environmental situation in the Fildes Region. If the region is designated as an Antarctic Specially Managed Area (ASMA), efforts can be concentrated and measures can be made more effective, thus achieving better results in environmental protection and efficiency of research.

The appendices to the report contain information material developed as part of the project. This is in the form of a poster in English, Russian, Spanish and Chinese, which gives general rules and regulations, as well as providing information about the special features of the Fildes Region. All relevant documents from the international discussion process at the level of the meeting of the Antarctic Treaty Parties are also appended.

Finally, **unanswered questions** and **research needs** are examined. Here, continued environmental monitoring is considered to be of great importance. Other recommendations include studies of colonisation by flora and fauna in areas made available by glacier melting and investigations into the causes of population decline in certain animal species, such as Adélie and chinstrap penguins.