

Conservation Strategy and Action Plan for the Great Bustard (*Otis tarda*) in Morocco

2016–2025



About IUCN

IUCN, International Union for Conservation of Nature, helps the world find pragmatic solutions to our most pressing environment and development challenges.

IUCN's work focuses on valuing and conserving nature, ensuring effective and equitable governance of its use, and deploying nature-based solutions to global challenges in climate, food and development. IUCN supports scientific research, manages field projects all over the world, and brings governments, NGOs, the UN and companies together to develop policy, laws and best practice.

IUCN is the world's oldest and largest global environmental organization, with more than 1,200 government and NGO Members and almost 11,000 volunteer experts in some 160 countries. IUCN's work is supported by over 1,000 staff in 45 offices and hundreds of partners in public, NGO and private sectors around the world.

www.iucn.org

About the IUCN Centre for Mediterranean Cooperation

The IUCN Centre for Mediterranean Cooperation was opened in October 2001 with the core support of the Spanish Ministry of Environment, the regional Government of Junta de Andalucía and the Spanish Agency for International Cooperation and Development (AECID). The mission of IUCN-Med is to influence, encourage and assist Mediterranean societies to conserve and sustainably use natural resources in the region, working with IUCN members and cooperating with all those sharing the same objectives of IUCN.

www.iucn.org/mediterranean

About the IUCN Species Survival Commission

The Species Survival Commission (SSC) is the largest of IUCN's six volunteer commissions with a global membership of 9,000 experts. SSC advises IUCN and its members on the wide range of technical and scientific aspects of species conservation and is dedicated to securing a future for biodiversity. SSC has significant input into the international agreements dealing with biodiversity conservation.

www.iucn.org/about/work/programmes/species/who_we_are/about_the_species_survival_commission/

About the Species Conservation Planning Sub-Committee

The Species Conservation Planning Sub-Committee (SCPSC) was established in 2010, answering to the Species Survival Commission (SSC) Steering Committee. Its purpose is to disseminate the philosophy, methodologies and processes for effective species planning deriving from the 2008 Strategic Planning for Species Conservation Handbook*. Members of the SCPSC work with many of the SSC's 120 Specialist Groups on their species planning activities, but are also consulted by international conventions and government institutions on planning approaches. One goal of the SCPSC is to establish a bench mark of good practice for conserving species. This will contribute to planning for the vast diversity of species needing conservation support and the multitude of conditions under which these species exist.

The SCPSC is the means for SSC to build on Red List assessments, and to contribute to IUCN's efforts to meet a milestone global challenge: the Convention on Biological Diversity's Biodiversity Target 12 for 2010-2020 which states that by 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

* http://cmsdata.iucn.org/downloads/scshandbook_2_12_08_compressed.pdf

About the IUCN Bustard Specialist Group

The current mission of this deliberately small group is to advise on, support and contribute to the conservation of the three highly threatened bustards in the Indian subcontinent and Cambodia, namely Great Indian Bustard *Ardeotis nigriceps* (Critically Endangered), Bengal Florican *Houbaropsis bengalensis* (Critically Endangered) and Lesser Florican *Sypheotides indica* (Endangered). In due course it will expand to provide particular support for other species, but it recognises that functioning networks of world experts already exist for Palearctic species, including the Great Bustard.

www.iucn.org/about/work/programmes/species/who_we_are/ssc_specialist_groups_and_red_list_authorities_directory/birds/

About the High Commission for Water, Forests and Desertification Control

The Haut Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification (HCEFLCD) of Morocco is the institution in charge of preparing and implementing the government policy related to the conservation and sustainable use of forestry, esparto and silvo-pastoral resources in the areas under a forestry regime, as well as the development of hunting, continental fishing and natural parks and reserves.

In this respect, the aim of the HCEFLCD includes conserving and protecting biodiversity in general, and wildlife and habitats in particular, through rehabilitation of ecosystems and protection of natural areas and threatened or endangered species.

www.eauxetforets.gov.ma/fr/index.aspx

Conservation Strategy and Action Plan for the Great Bustard (*Otis tarda*) in Morocco

2016–2025

International Union for Conservation of Nature and Haut Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification, Kingdom of Morocco



The designation of geographical entities in this book and the presentation of the material do not imply the expression of any opinion whatsoever on the part of IUCN or other participating organizations concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. The views expressed in this publication do not necessarily reflect those of IUCN or other participating organizations.

Published by: IUCN Malaga, Spain and HCEFLCD, Kingdom of Morocco

Copyright: © 2016 International Union for Conservation of Nature and Natural Resources

Reproduction of this publication for educational or other non-commercial uses is authorized without prior written permission from the copyright holder(s) provided the source is fully acknowledged.

Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder(s).

Citation: IUCN and HCEFLCD (2016). *Conservation Strategy and Action Plan for the Great Bustard (Otis tarda) in Morocco 2016-2025*. Malaga, Spain: IUCN/HCEFLD. 48 pp.

ISBN: ISBN: 978-2-8317-1743-2

DOI: English version: 10.2305/IUCN.CH.2015.SSC-AP.10.en

Cover images: [front cover] Great Bustard illustration by Cassia Dodman
[title page] Great Bustard photographed during the Moroccan Great Bustard census in March 2015. Photo © Rachid El Khamlichi
[back cover] Male Great Bustard displaying. Photo © Carlos Palacín

Layout by: Alex Storer (IDFP Creative Design), United Kingdom

Available from: IUCN Centre for Mediterranean Cooperation
C/ Marie Curie 22
29590 Campanillas
Malaga, Spain
Tel: +34 952 028430 - Fax: +34 952 028145
www.iucn.org/mediterranean
www.iucn.org/publications

This publication was funded by MAVA Foundation in the framework of the project '*Improving capacity for species conservation in the Mediterranean region: Training in the preparation and implementation of Species Conservation Strategies in three Maghreb countries*'.

Compiled and edited by Tim Dodman with contributions from (in alphabetical order) Maknass Abdellilah, Rachid Aboulouafae, Elisa Alcázar, Juan Carlos Alonso, Zouhair Amhaouch, Zinelaabidin Arhzaf, Violeta Barrios, Abdelaziz Bouabbad, Adel Bouajaja, Med Bousfizza, Abderraouf Britel, Nigel Collar, Younis Chaker, Said Chakri, Imad Cherkaoui, Azizi Driss, Mohammed Aziz El Agbani, Abdelaziz El Idrissi Essougrati, Rachid El Khamlichi, Brahim Haddane, Oumnia Himmi, Ksassoua Kébir, Chris Magin, David Mallon, Hayat Mesbah, Mohamed Noaman, Catherine Numa, Azzat Ouafae, Carlos Palacín, Abdeljebbar Qninba, Rainer Raab, Mohamed Radi, Ahmed Salmi M'rabet, Sonsoles San Román, Mustapha Sidi Ben Salah, Michel Thévenot and Antonio Troya.

Table of contents

1. Foreword.....	4
2. Executive Summary	5
3. Introduction.....	6
3.1 The Great Bustard	6
3.2 The Moroccan population of Great Bustard.....	6
4. Current Status of Great Bustard in Morocco (2015)	8
4.1 Numbers and distribution	8
4.2 Status.....	8
5. Threat Analysis.....	10
5.1 Direct and Indirect Threats.....	10
5.2 Constraints	13
5.3 Threat Ranking	15
6. Conservation Strategy	17
6.1 Vision	17
6.2 Goal.....	17
6.3 Intervention Strategies	17
6.4 Strategic Objectives.....	22
7. Conservation Action Plan	23
8. Monitoring Plan: Indicators and Means of Verification.....	31
9. Implementation of the Conservation Action Plan	34
9.1 Considerations for implementation and need for review	34
9.2 Practicalities	34
10. Acknowledgements	35
11. Acronyms	36
12. Bibliography	37
Appendix I: Overview of Stakeholder Workshop.....	39
Appendix II: Action Plan Development Mission, March 2015	41

1. Foreword

‘To conserve Great Bustards we need do very little’, wrote Wolfgang Gewalt in his pioneering monograph *Die Grosstrappe* (1959), ‘but there is a lot we must not do’.

He was making an important point. Left alone, the Great Bustard can survive and multiply well enough. It does not need close management and manipulation of the type that certain other threatened species need to help them survive. It can look after itself.

But it is a highly traditional species. The places where it displays each spring - the ‘leks’ - are the same from year to year. The males appear to be ‘imprinted’ on the landscape where they parade. The females come to the leks to select a mate, and then retreat into cover, usually not more than a few kilometres away, to rear their young alone. The young males may wander to another lek, if there is one; the young females tend to stay where they were born. Everything works well in this system as long as nothing changes.

The species has fared a little better in Morocco than two other members of its family. A hundred years ago the Little Bustard *Tetrax tetrax* was common in farmland across northern Morocco, while the Arabian Bustard *Ardeotis arabs* could be found in at least half-a-dozen places. The two species, one Palearctic, the other Afrotropical, were present together in and around Mamora Forest near Rabat - what a glorious thought! But from causes too distant in time to be identified with confidence, the Little Bustard is now more threatened in Morocco than the Great, and the Arabian has now gone completely.

The same fate is about to befall the country’s last Great Bustards. As the evidence assembled in this excellent action plan shows, the population of the species has slowly but inexorably dwindled over the past two decades, and is now at a critical point. The number of males remaining is now so low that the loss of even one of them will be a blow to the survival of the species in Africa.

Why has it come to this? Because something has changed; or, far more likely, some things have changed. Illegal hunting, power lines, agricultural intensification, disturbance - all are identified in this plan as contributing to the loss of the species. The problem for us is that we do not know which of these is the most important influence, which the most urgent to tackle first, how much energy, time and money to direct at each. Any one of them might be exerting a decisive pressure but, since we do not know which, we must focus on all of them. If we do not, we risk everything.

But the Great Bustard can be saved in Morocco. This plan points the way with exemplary clarity and meticulous care. Everyone associated with its production deserves our thanks and praise. But the challenge is immense. It is as if we have to turn back the clock. The last areas where the Great Bustard survives need to be managed to replicate their condition half a century ago, before asphalt, cars, tractors, agricultural machinery, modern weapons and electricity made their way into the contemporary Moroccan landscape. These are the things that Wolfgang Gewalt was referring to when he said, with oblique irony, ‘there is a lot we must not do’. He also said, very simply, directly and truly - and I commend it as the guiding principle and dictum of the coming endeavour:

‘Nothing is so essential to our bustards as peace, and still more peace’.

N.J. Collar, Chairman, IUCN Bustard Specialist Group



IUCN Bustard
Specialist Group

2. Executive Summary

The Moroccan population of the Great Bustard *Otis tarda*, a Vulnerable species according to the IUCN Red List of Threatened Species™, is small and declining, surviving mainly in two breeding areas (leks) and numbering some 40 to 50 birds. The population has a bleak outlook, which merits urgent conservation action. The main threats to this, the only population of Great Bustard in Africa, are collisions with power lines and other infrastructure, agricultural intensification, illegal hunting (or poaching), and different forms of disturbance, some of which have resulted in habitat fragmentation. Overall, factors affecting adult mortality are the most immediate and urgent threats to survival. Great Bustard conservation is also hampered by a number of constraints, such as inadequate designated status of core areas. The remaining strongholds are in Araoua and Tleta-Rissana, whilst other areas in northwest Morocco certainly used to support bustards until recently. In the early 2000s there were seven leks, in 2015 only two were found.

This plan is guided by a vision that by 2050, the Moroccan population of the Great Bustard will be viable and have expanded into areas of its former range with a minimum of five successful leks, in harmony with the local socio-economic context and in accord with sustainable development. The goal is that by 2025, the key leks of Araoua and Tleta-Rissana will be safeguarded by appropriate national designations and strong community support, with the Great Bustard population increased to 80-100 birds and starting to expand to former areas, where appropriate conditions for recolonisation have been ensured.

In order to achieve this, six intervention strategies have been identified: establish surveillance capacity; minimise impacts from infrastructure; secure bustard habitat in key areas; strengthen awareness and valuation; research and monitoring; and sustainable financing. For each, a long-term objective and strategic objectives have been set, and prioritised actions prescribed to cover the period 2016-2025, with indications of responsibility and budget. Indicators and means of verifications have also been defined for each strategic objective in order to monitor implementation of the action plan and levels of attainment.

Implementation of the plan requires the urgent establishment of surveillance capacity backed up by measures to secure a traditional agricultural landscape within an appropriate site designation framework. The risk of collisions of bustards with power lines must be minimised, especially through underground cabling and marking, and poaching must be brought under control in order to cut out human-induced adult mortality. At the same time, bustards must have suitable habitat available throughout the year to enable them to successfully see through their unique and impressive annual cycle. Strong national cooperation and attention backed up by strategic international support are essential.



Three males of different ages at Laquessiba, Chekbouchan lek in 2005 (photo © Carlos Palacín).

3. Introduction

3.1 The Great Bustard

The Great Bustard *Otis tarda* (Linnaeus, 1758) is a Vulnerable species (BirdLife International 2013) with a wide range from Iberia and northwest Morocco in the west to China in the east. There are two subspecies: *O. t. tarda*, which extends from Iberia and north Morocco through central and southeast Europe to Turkey, Iran and east to Kazakhstan and central Siberia; and *O. t. dybowskii*, which occurs in southeast Russia, Mongolia and China. Asian populations are obligate winter migrants (Kessler 2013), whilst Eastern European populations migrate from Russia to wintering areas in South Ukraine (Watzke 2007). Western populations, including the northwest Morocco population are resident or partial migrants, showing a variety of migratory patterns across their Palaearctic range. Central European populations are facultative winter migrants in response to extreme weather (Streich *et al.* 2006); Iberian populations are partial and differential migrants by sex, with variable proportions of both sexes migrating according to sex-specific patterns (Alonso *et al.* 2000a, 2001 and 2009b; Morales *et al.* 2000; Palacin *et al.* 2009, 2011 and 2012).

Great Bustard is listed on Appendix I of the Convention on the Conservation of Migratory Species of Wild Animals (CMS, or Bonn Convention) and on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on the Conservation of European Wildlife and Natural Habitats (or Bern Convention).

The Great Bustard world population was estimated in 2010 to be 44,100-57,000 individuals, with about 60-74% occurring in Iberia (Alonso and Palacín 2010).

The Great Bustard was formerly widespread across this wide range, which has contracted significantly, resulting in a number of fragmented populations, some of which have disappeared (Palacín and Alonso 2008). Its status of Vulnerable is linked especially to this fragmented distribution and declines in a number of areas. For *O. t. tarda*, six demographically independent breeding populations are recognized in the Western Palearctic (Fragó 1986, Nagy 2009), as well as a population breeding from Southwest Russia through Kazakhstan to Northwest China:

- North African – Morocco
- Iberian – Spain, Portugal
- German-Polish Plain – Germany, Poland
- Carpathian basin – Austria, Czech Republic, Hungary, Slovakia, Serbia, Romania and Bulgaria
- Eastern European – European Russia, Ukraine
- Middle-East – Turkey (extending into west Iran)

3.2 The Moroccan population of Great Bustard

The Great Bustard is an endangered species in Morocco, historically restricted to three geographic divisions – the Tangier Peninsula, Rharb and Prérif (Thévenot *et al.* 2003). This population is the only African population of Great Bustard, which also represents the southern limit of the world breeding area (Alonso *et al.* 2005). All areas are in the northwest of the country, where seven leks (traditional places where males assemble during the mating season and engage in competitive displays that attract females) were identified in 2005 (Figure 1), when the population was estimated at 80-113 birds (Alonso *et al.* 2005).

Genetic studies indicate that the population in Morocco was colonised from Iberia thousands of years ago, with population declines and the barrier effect of the Gibraltar Straits favouring current genetic isolation; indeed, Morocco could be regarded as separate management unit, holding a significant proportion of the current genetic diversity of the species, which thus deserves urgent conservation measures (Alonso *et al.* 2009a). Complementary microsatellite analyses reveal the existence of three main genetic units corresponding to Morocco, the north-eastern part of Spain, and the rest of the Iberian Peninsula (Horreo *et al.* 2014).

Legislation

Under the provisions of the Dahir dated 21 July 1923 on the hunting policy, as amended, and of its implementing texts, it is illegal to capture, hunt or own the Great Bustard, which is listed as a protected species.

It is also listed in Category 2 under Law No. 29-05 on the protection and trade regulation of species of wild fauna and flora (“loi n° 29-05 relative à la protection des espèces de flore et de faune sauvages et au contrôle de leur commerce”).

Under the provisions of this Law, it is illegal to collect, without permission and by any means, specimens of such species from the wild.

The Great Bustard population in Morocco is in decline, with annual estimates in the most northern leks decreasing from 99 birds in 1999 to 80 birds in 2005, and with the main threats identified as poaching, especially of males, collisions with power lines and agricultural intensification (Alonso *et al.* 2000 and 2005). It is forbidden by law to hunt this species in Morocco.

More details on the species' biology, distribution and habitats can be found in the status review document (available in French) accompanying this strategy report, entitled "La grande outarde (*Otis tarda*) au Maroc : État des connaissances sur l'espèce" (Qninba 2016).

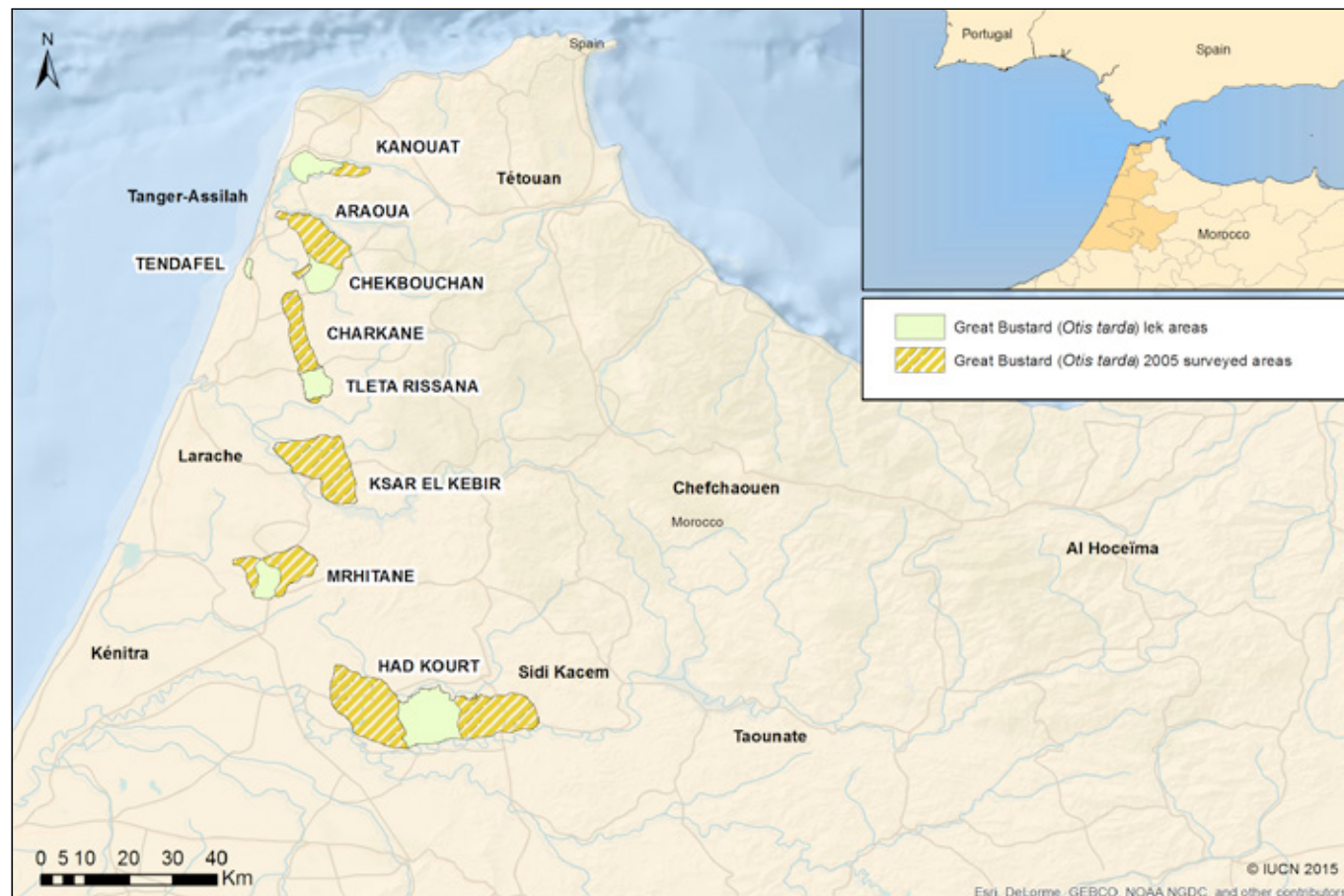
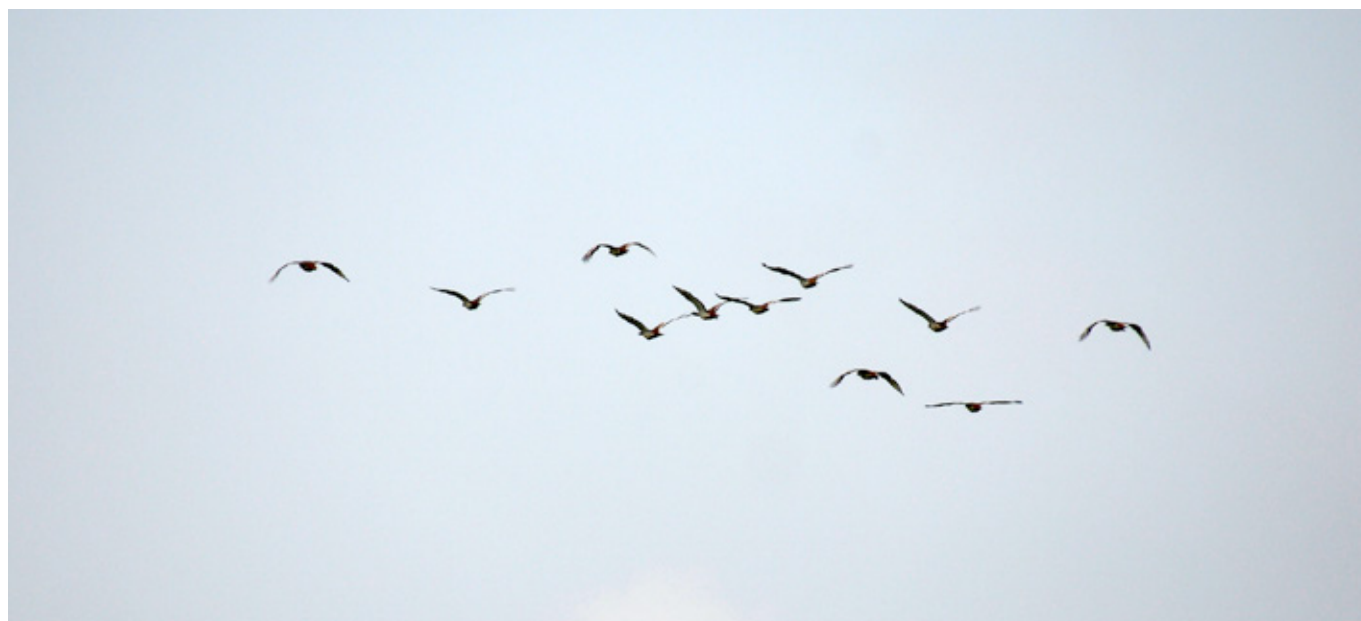


Figure 1. Great Bustard study area of 1999-2005 showing seven Great Bustard lek areas (light green patches) and two areas where bustards have been seen only in winter (Charkane) or occasionally reported (Ksar-el-Kebir) and the intensively surveyed areas (hatched) (Alonso *et al.* 2005).



A flock of Great Bustards flying over Araoua, northwest Morocco, March 2015 (photo © Rachid El Khamlichi).

4. Current Status of Great Bustard in Morocco (2015)

4.1 Numbers and distribution

Great Bustard estimates have been derived from censuses carried out in Morocco in the springs of 1999, 2001, 2002, 2005 and 2015, giving a good indication of the size of the population over a 16-year period; further surveys were conducted in 2009, 2011 and 2014 (C. Palacín *in litt.* 2015) although results have not yet been published. Results of the censuses in 1999-2005 and 2015 are given in Table 1, which shows a summary of total birds estimated drawing on spring surveys and additional data, as well the total number of birds counted during the censuses; further details available in Alonso *et al.* (2005) and Alonso *et al.* (2015).

Additional censuses were conducted in 2003, 2004, 2006 and 2007 yielding total counts respectively of 45, 42, 60 and 77 birds (Arhzaf 2010) (these data are not shown in Table 1, which focuses on the total estimated population size). The dynamics and trend of the Moroccan Great Bustard population between 1999 and 2014 were studied by Palacín *et al.* (2016), who provide additional total counts of 49 birds in 2009, 41 in 2011 and 34 in 2014. During the census of the Moroccan population of Great Bustard on 9-13 March 2015 covering the seven previously identified lek areas, 40-44 bustards were found only in two areas – Araoua and Tleta-Rissana (Figures 2 and 3), although all previous lek areas were visited, resulting in a new population estimate of 45-50 birds (Alonso *et al.* 2015). Of birds located, 11 were males and 29-33 were females.

Table 1. Summary of estimates of Great Bustards in Morocco derived from spring censuses and additional information; census results are shown in standard font whilst estimated figures are in italics and bold (after Alonso *et al.* (2005) and Alonso *et al.* (2015). The figure of 90 under 'Total in census' for 1999 is from a count by Hellmich and Idaghdour (2002) in December 1998.

Leks	1999	2001	2002	2005	2015
Kanouat	14	8	8	5	0
Araoua	26	26	26	16	42
Chekbouchan	13	13	16	15	0
Tendafel	24	27	23	17	0
Tleta-Rissana	10	12	6	17	3
Mrhitane	6	6	6	6	0
Had-Kourt	6	6	5	4	0
Total in census	70-90	84	76	71	40-44
Total estimated	99	98	90	80	45-50

4.2 Status

The census results paint an alarming picture of decline in both numbers and range, especially between 2005 and 2015. This represents a decline of at least 40% over 10 years, confirming the critical conservation status of the Great Bustard in Morocco, noting also a sex ratio of around 1 male to 3-4 females and, more positively, a high productivity year in 2014 (Alonso *et al.* 2015). The decline based on actual counts may be as high as 55% between 1999 and 2015, or 62% between 1999 and 2014. Palacín *et al.* (2016) estimate that the population could become extinct in about 20 years if present threats remain.

The declining trend in numbers is illustrated in Figure 4, showing a steep trend line, which, if allowed to continue, will clearly spell the end of this population within a short time frame. The apparent loss of up to five occupied leks between 2005 and 2015 is also of major concern. Whilst it is possible that bustards still utilise some of these areas, it seems likely that they no longer function as leks. This situation could be reversible, at least for some areas, leaving two population challenges – one to increase the population size, the other to encourage recolonisation of former leks. Both are needed for the status of Great Bustards in Morocco to improve and for the population to sustain itself into the future.

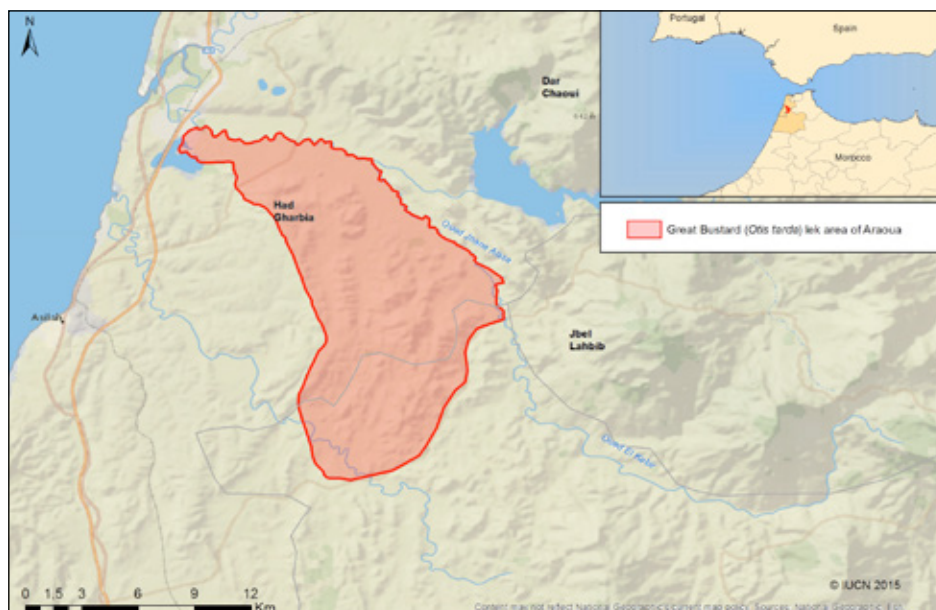


Figure 2. Boundary of the Great Bustard lek area of Araoua (adapted from Google Earth map produced by C. Palacín for Alonso *et al.* 2015).

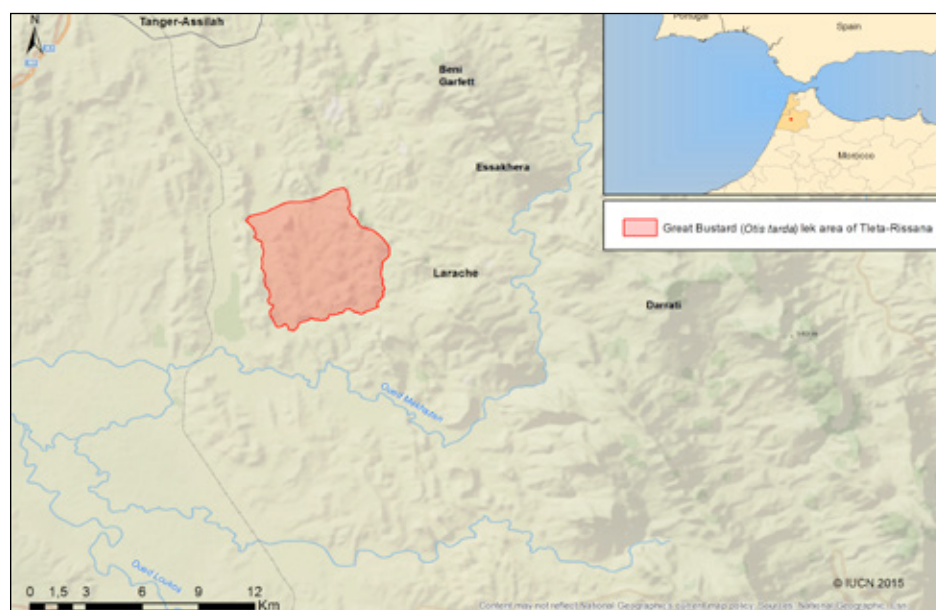


Figure 3. Boundary of the Great Bustard lek area of Tleta Rissana (adapted from the Google Earth map produced by C. Palacín for Alonso *et al.* 2015).

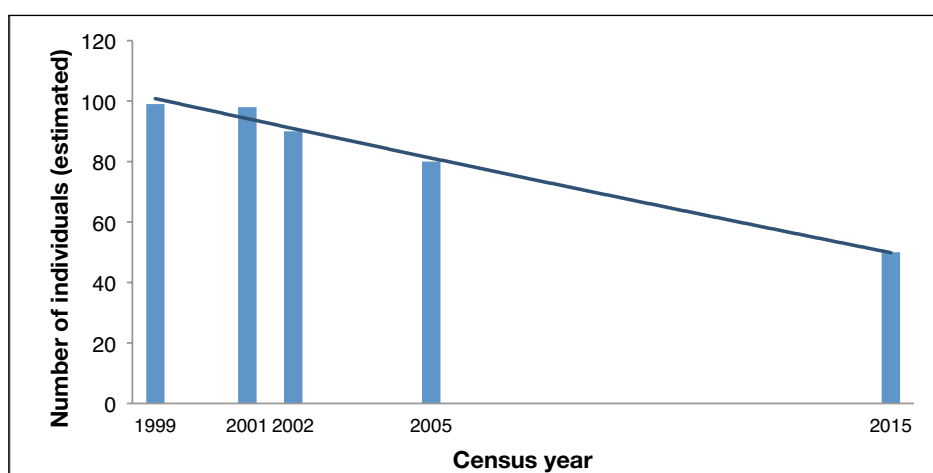


Figure 4. Estimates of the Great Bustard population in Morocco from five censuses carried out between 1999 and 2015, with trend graph shown; based on data in Alonso *et al.* 2005 and Alonso *et al.* 2015.

5. Threat Analysis

Great Bustards in Morocco are prone to a number of threats, of which the direct threats on adult mortality are the most severe. Threats have been described and detailed by Hellmich and Idaghdour (2002), Alonso *et al.* (2005), Arzaf (2010) and Qninba (2016), and were also listed and ranked by the stakeholder workshop participants. In addition, Palacín *et al.* (2016) analysed the growth in infrastructure between 2005 and 2014. Full accounts of threats are thus not given below, rather an overview of threats to guide the development of the action plan. The threats described below are based on all these sources and on information collected during the action plan development mission of March 2015, as well as on 2015 census results (Alonso *et al.* 2015).

5.1 Direct and Indirect Threats

Alonso *et al.* (2015) consider that adult mortality represents the main threat to the Great Bustard population in Morocco, and thus any human-induced adult mortality cause should be eliminated. The main threats and potential threats identified in September 2014 by participants of the Stakeholder Strategy Development Workshop and through the 2015 census fieldwork and interviews and site visits in March 2015 are as follows:

- **Poaching / illegal hunting, especially of males**

- ♦ Breeding males are magnificent, and thus a highly prized hunting trophy.
- ♦ Breeding males are also especially vulnerable during the courtship period, when they display in open areas.
- ♦ The imbalanced sex ratio of the population is an indication of targeted male hunting.
- ♦ Local people report incidences of hunters coming to look for Great Bustards.

- **Collisions with power lines**

- ♦ Great Bustards are prone to collisions due to their reduced frontal vision angle and relatively low manoeuvrability.
- ♦ Arhzaf (2010) reports of seven cases of Great Bustard collisions in Morocco, mostly with power lines.
- ♦ This is the main cause of bustard mortality in parts of Spain (Alonso *et al.* 2003, Martín *et al.* 2004, Palacín *et al.* 2004), Austria and Hungary (Raab *et al.* 2012). A new power line in Spain killed at least 25 Great Bustards in an 8.5 km long sector of line in one year (C. Palacín, *in litt.* 2015).
- ♦ Power lines already cross Great Bustard areas in Morocco, including across valleys close to principal leks. Palacín *et al.* (2016) report on seven new power lines totalling 19 km between 2005 and 2014 in Kanouat and Araoua lek areas.
- ♦ No power lines in Morocco carry markers.
- ♦ Since 2005, hundreds of new power lines have been installed under the global rural electrification programme in the provinces of Morocco where Great Bustards survive, or have survived until recently. Power lines are likely to intensify further still in the Great Bustard's Moroccan range.



Great Bustards flying over a power line in Araoua; this power line crosses a valley through which bustards must pass frequently (photo © Rachid El Khamlichi).

- **Agricultural intensification, including use of chemicals**

- ♦ Great Bustards cannot survive in an intensively managed agricultural landscape, especially large expanses of monoculture, where there is the added threat of mechanical harvesting. Palacín *et al.* (2016) recorded 39 new farms in lek areas between 2005 and 2014, including 18 in Araoua.
- ♦ Some parts of their former range have seen significant agricultural developments.
- ♦ The heavy use of chemicals (fertilizers, herbicides, insecticides) would no doubt have an impact on Great Bustards, most likely on the productivity; bustard chicks / young are partially reliant on an invertebrate diet.

- **Loss of habitat**

- ♦ Loss of habitat is largely due to agricultural intensification.
- ♦ A particular threat is the loss of natural cover. Cover is likely to be in very short supply after harvest of crops in the summer.
- ♦ Some areas in the north of the bustard's range have been impacted by urban development, e.g. Tangier airport and an area set aside for sewage treatment.

- **Infrastructure developments (road, rail, etc.)**

- ♦ The Great Bustard's range in Morocco falls between Tangier and Meknès, and is traversed already by national roads, a motorway and railway. There is good evidence that Great Bustards avoid roads and other sources of disturbance (Lane *et al.* 2001).
- ♦ Currently, a new high-speed rail line is being constructed.
- ♦ High-speed railways can kill bustards, whilst road/rail construction causes permanent habitat loss as bustards tend to avoid them, with a threshold distance of about 750 m (Torres *et al.* 2011).
- ♦ Their development is also associated with clearance of habitat, erection of power / other lines along their routes and cutting up of landscapes, often leading to further impacts.
- ♦ Transport line increases between 2005 and 2014 within lek areas include 10 km of highway, 2 km of high-speed train line and 33.2 km of rural roads (Palacín *et al.* 2016).

- **Disturbance and destruction of nests and chicks**

- ♦ As Great Bustards nest in farmland, inevitably they will experience some measures of disturbance.
- ♦ Trampling of nests by livestock is also a potential threat, as is early mechanised crop harvesting.
- ♦ Disturbance/predation of dogs may constitute a threat, especially to eggs and chicks. Although Great Bustards and shepherds and their dogs have co-existed for hundreds of years, feral dogs appear to be widespread (and possibly increasing) in parts of the Great Bustard's range.
- ♦ The potential impact of natural predators, such as foxes, is unknown.



A pack of loose or feral dogs in Araoua (photo © Tim Dodman).

These threats are illustrated in the following problem trees (Figures 5 and 6).

Overarching factors include climate change and development in northern Morocco, with an increasing human population exerting greater environmental pressures in the rural landscape. These are also driving factors for most threats listed but it is not realistic to mitigate climate change or human population growth within a species action plan.

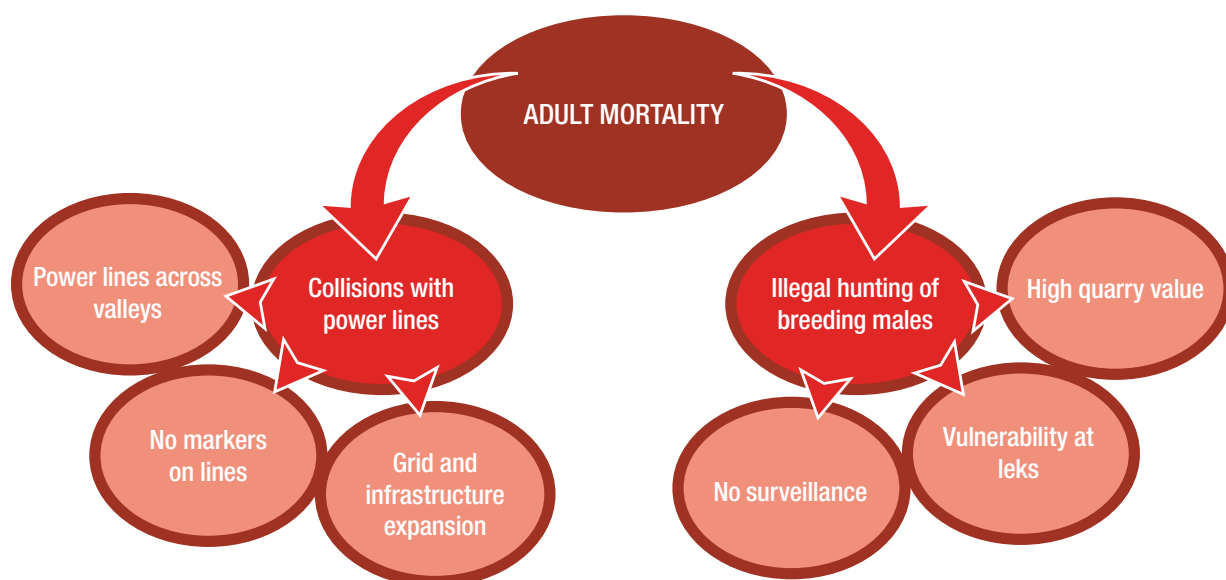


Figure 5. Problem tree analysis: Threats causing adult mortality.

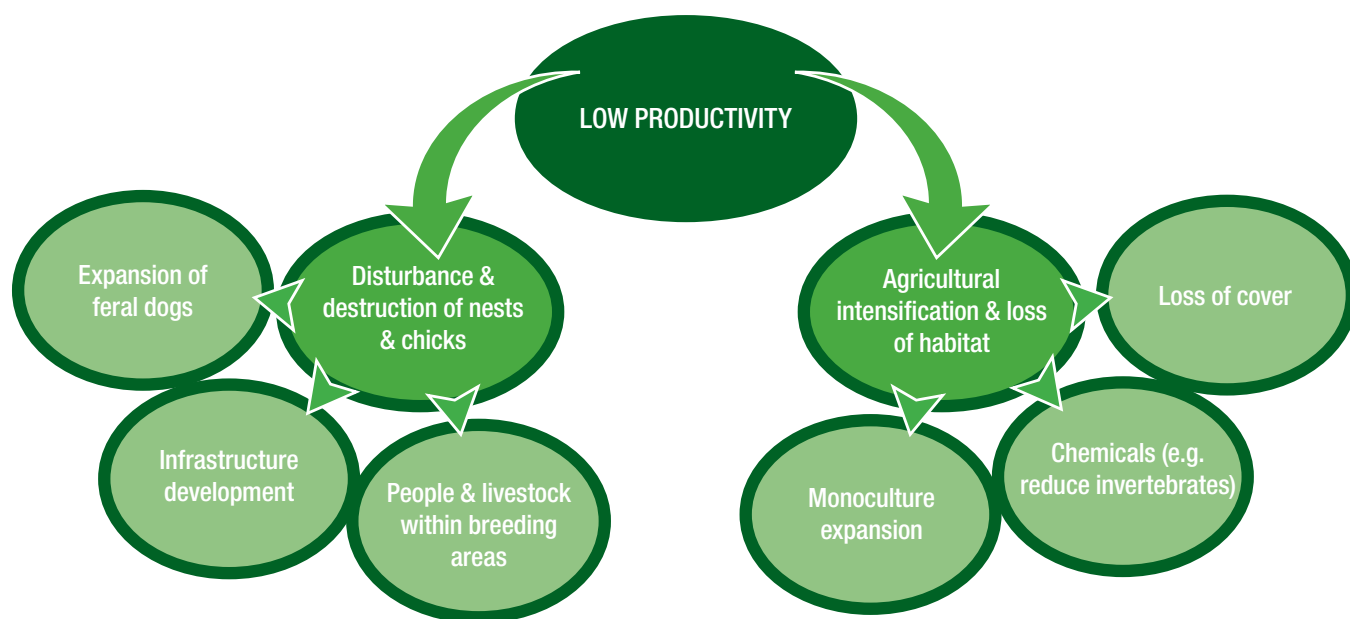


Figure 6. Problem tree analysis: Threats causing low productivity.

5.2 Constraints

In addition to these direct and indirect threats, a number of constraints to Great Bustard conservation in Morocco have been identified. These are factors that may influence the capacity and/or the willingness to address the threats; or they may be precursors required for reducing threats. The principal identified constraints are given below, and summarised in Figure 7:

- **Limited integrated planning for the conservation, monitoring and research of the Great Bustard and its habitat**
 - ♦ Although threats have been identified over the years, there has been no consistent conservation planning for the Great Bustard in Morocco. However, the need for such planning has been identified, and should be addressed by the adoption and implementation of this plan.
 - ♦ No Great Bustard areas are protected, despite the rarity of the species.
 - ♦ Censuses during the courtship season have been carried out regularly since 1999, although results between 2005 and 2015 are not yet widely available.
- **Weak or absent protection of current and recently abandoned lek areas**
 - ♦ Some areas have been designated as Sites d'Intérêt Biologique et Écologique (SIBEs, Sites of Biological and Ecological Interest), whilst Great Bustards occur at times in some floodplain areas of the Complexe du Bas Tahaddart Ramsar Site (Dakki *et al.* 2011). However, these designations do not adequately cater for priority bustard areas, nor do they carry sufficient weight to afford meaningful site protection measures.
- **Irregularity of scientific research with a focus mainly on breeding season**
 - ♦ Apart from winter/early spring censuses, no regular research is carried out, and knowledge about bustard status outside the (early) breeding season is limited.
- **Limited means (human and financial) available for Great Bustard conservation**
 - ♦ Resources have been available in the past for some conservation activities, mainly as a result of past road developments. However, no government funds have yet been set aside for Great Bustard conservation, nor external donors identified.
 - ♦ The support of the current planning process presents a fresh opportunity to mobilise resources.
 - ♦ There are no personnel within government or civil society sectors currently engaged in Great Bustard on a regular basis.
- **Poor coordination between government sectors**
 - ♦ As the Great Bustard lives largely in agricultural areas, different government sectors need to be engaged in conservation activities and designations.
- **Limitations of Environmental Impact Assessments (EIAs)**
 - ♦ Infrastructural developments do not tend to take the Great Bustard into proper consideration during the planning and development stages.
- **Low level of awareness about the critical status of bustards in Morocco**
 - ♦ There is low awareness about the critical status of the Great Bustard in Morocco at the local level and within other circles.
- **Low economic value attributed to the Great Bustard**
 - ♦ The population of the Great Bustard is far too small to allow the valuation of the species through hunting. Moreover, it is illegal to hunt the Great Bustard in Morocco.
 - ♦ Earnings that may be derived from the development of tourism-based activities in connection with the Great Bustard seem very limited, although this option may be explored during the implementation of this plan.
- **Difficulty to breed Great Bustards in a captive setting**
 - ♦ There is an interest within some sectors for captive rearing of Great Bustards, but past efforts elsewhere have demonstrated that this is not at all easy, would be extremely expensive and offers no guarantee of successful reintroduction in the future.

Several threats and constraints are closely linked and overlapping.

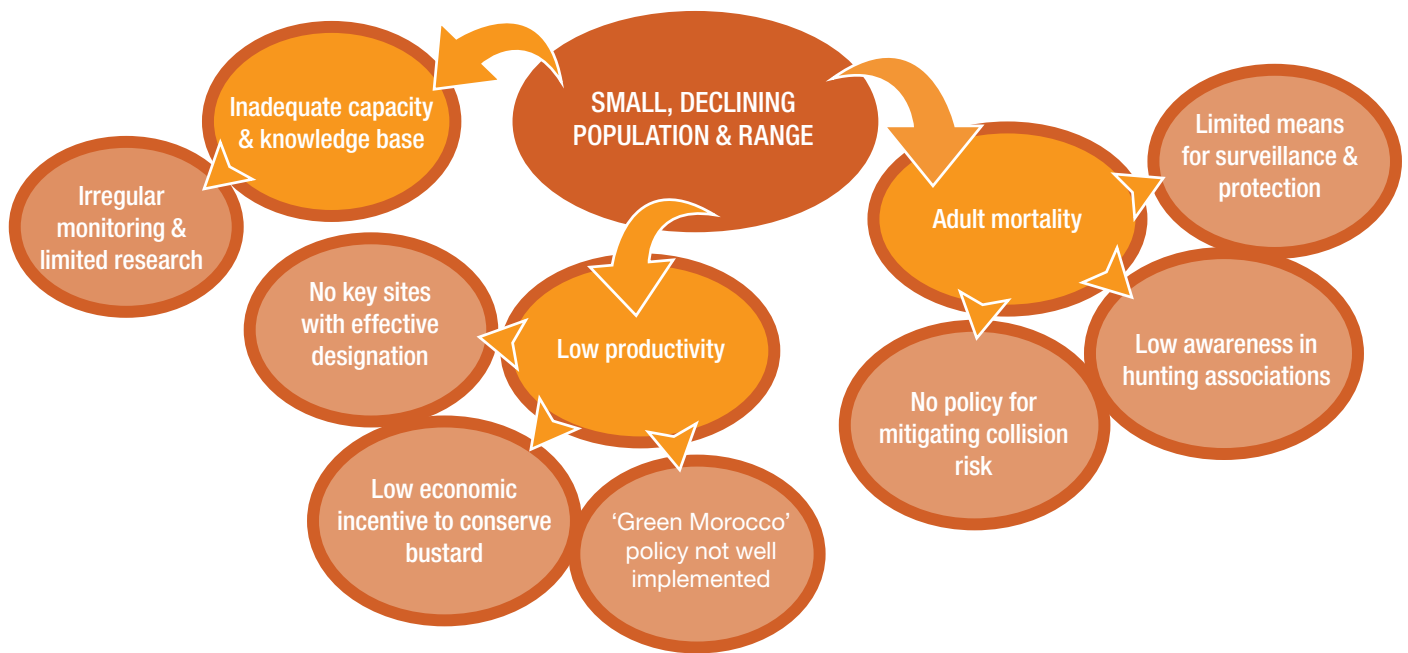


Figure 7. Problem tree analysis: Constraints contributing to the small, declining population and range status of the Great Bustard in Morocco.



Early harvest in areas where bustards breed has been recorded as a threat (Arhzaf 2010), one aspect of agricultural intensification, which has a landscape-wide impact (photo © Tim Dodman).

5.3 Threat Ranking

Threat ranking was not carried out in detail during the Stakeholder Workshop of September 2014, but separate groups clearly identified the main threats as illegal hunting and collisions. Information from the workshop and references combined with information collected during interviews conducted in March 2015 results in the threat ranking below (Table 2), which follow the format of an Important Bird and Biodiversity Area (IBA) form of BirdLife International. Note that the combined score is not a standard means of IBA threat ranking.

Table 2. Great Bustard Threat Ranking, Morocco

THREAT TYPES	Score			Combined Score	Details
	Timing	Scope	Severity		
Factors causing adult mortality					
Collisions with power lines	3	3	3	12	Rarely recorded, but certainly significant and expanding
Poaching / illegal hunting, especially of males	3	2	3	9	Significant even if 1 adult male per year is hunted
Factors causing low productivity					
Habitat loss and modification: infrastructure development (roads/railways), urban expansion	3	2	2	7	Current threat with potential long-term impact
Agricultural intensification, including use of chemicals					Split into sub-threats below
Annual crops	3	2	0	3	Widespread but not severe
Small-holder farming	3	2	3	9	High threat on landscape scale
Agro-industry farming	3	3	0	3	Widespread but not severe
Livestock farming and ranching (small-holders)	3	2	1	5	Hard to quantify / measure
Disturbance and destruction of nests and chicks, including potential predation (e.g. by dogs)	2	1	0	2	Unlikely to have an impact
Tourism and recreation areas					
Overarching threats					
Climate change	1	2	1	3	Potential impacts need investigation

Timing of selected threat	Timing score	Severity of selected threat	Severity score
Happening now	3	Rapid deterioration (>30% over 10 years or 3 generations whichever is longer)	3
Likely in the short term (within 4 years)	2	Moderate deterioration (10–30% over 10 years or 3 generations)	2
Likely in the long term (beyond 4 years)	1	Slow deterioration (1–10% over 10 years or 3 generations)	1
Past (unlikely to return) and no longer limiting	0	No or imperceptible deterioration (<1% over 10 years)	0
Scope of selected threat	Scope score	The combined score was developed based on the three other scores, giving weight to scope and severity: Combined score = (Scope x Severity) + Timing.	
Whole area or bird population (>90%)	3		
Most of area or bird population (50-90%)	2		
Some of area or bird population (10-50%)	1		
Small area or few individual birds (<10%)	0		

The analysis based on timing, scope and severity indicates that collisions with power lines are the most significant threat to Great Bustards in Morocco, followed by illegal hunting and agricultural intensification on a more 'industrial' scale, i.e. the development of monoculture, as is happening particularly in the south of the bustard's range, then habitat loss and modification. These landscape threats combined are likely to be more important nowadays than illegal hunting. Disturbance is the next most significant threat, due both to disturbance of breeding birds and ongoing infrastructural developments.

Note that some threats are more expected than proven or are at least hard to quantify, such as disturbance and predation, whilst the direct impacts of climate change have not been studied.



Bustard chick (photo © Carlos Palacín)



Male victim of a collision with a power line in Spain (photo © Carlos Palacín)



Two female bustards (photo © Carlos Palacín)

6. Conservation Strategy

It is clear from the threats outlined above and the dwindling population size that urgent conservation measures are needed to prevent the extinction of the Great Bustard in Morocco, and indeed in Africa. Alonso *et al.* (2015) point out that numbers of Great Bustards in Morocco are similar to the minimum numbers reached in Germany and Austria in the 1990s, indicating that extinction could theoretically be avoided in Morocco, provided the necessary conservation measures are urgently implemented. The following Vision and Goal¹ are based on statements developed by the stakeholder workshop participants, but updated in light of the 2015 census, which found bustards in only two leks, as opposed to seven in 2005.

6.1 Vision

By 2050, the Moroccan population of the Great Bustard will be in a healthy, secure and viable state, and have expanded into areas of its former range with a minimum of five successful leks, in harmony with the local socio-economic context and in accord with sustainable development.

6.2 Goal

By 2025, the key leks of Araoua and Tleta-Rissana will be protected by appropriate national designations and strong community support, with the Great Bustard population increased to 80-100 birds and starting to expand to former areas, where appropriate conditions for recolonisation have been ensured.

6.3 Intervention Strategies

In order to meet the vision and goal, and based on the threat analysis, intervention strategies and objectives are needed, supported by short-term, medium-term and long-term activities. The following intervention strategies have been identified, whilst proposed activities are outlined in the next section:

- Establish surveillance capacity
- Minimise power line collisions and impacts from other infrastructure
- Secure bustard habitat in key areas
- Strengthen awareness and valuation
- Research and monitoring
- Sustainable financing

6.3.1 Strategy 1 – Establish surveillance capacity

The Moroccan population of Great Bustard is most vulnerable to adult mortality (Alonso *et al.* 2015). In order to address this, the birds need some measure of protection. The Great Bustard is a protected species in Morocco (Hellmich & Idaghdour 2002), but its main areas are not protected. Thus, the most effective immediate means of protection should be to take measures to prevent mortality of the birds, whilst other measures (such as establishing some kind of protected area) are likely to take longer to achieve.

All respondents to interviews considered that surveillance was paramount and that guards / guardians or *écogardes* should be employed to protect the remaining bustards. Surveillance cuts across all actions, as it involves building a local team, which would be responsible for managing and implementing the action plan on a day-to-day basis. Different mechanisms were proposed for putting in place a guardian system, with the following options possible:

- Uniformed guards employed by HCEFLCD
- Uniformed guards employed by civil society, e.g. GREPOM
- Uniformed guards employed by the Fédération Royale Marocaine de Chasse (Royal Moroccan Hunting Federation) in the framework of their *amodiation*
- Local shepherds serving as informers

¹ An overarching Vision is an inspirational and relatively short statement that specifies the desired status of a species (including range, ecological role and relationship with humans) over a given period (which should be long-term, typically 30–40 years). A Goal describes what can be realistically achieved in the medium-term (typically 5–10 years).

The main role of guardians would be to monitor and protect bustards, especially from hunters, and especially during the courtship and breeding season, focusing on leks. Guardians could keep records of observations and numbers of birds and GPS locations of all observed individuals. They should also monitor mortality at the most dangerous power lines through casualty transects, after training by specialists. Undoubtedly the presence of guards would also give out a strong awareness message, and people would know that protection measures were in place; the employment of locals as guardians would further demonstrate a local economic benefit.

Guardians would invariably need some resources to enable them to monitor bustards and watch out for any potential activity detrimental to them. Respondents made different suggestions, but some means of transport and communication (mobile phones) were deemed essential, whilst other attributes could include binoculars, telescope / tripod, uniform and boots.

Putting a guardian system in place would invariably involve coordination. There were suggestions to establish a Great Bustard centre or office, staffed by a project coordinator and assistant. This centre would serve as a focal point for the guardians and for all bustard conservation activities; it could also have displays and other awareness materials. Guardians would also need to be trained.

A guardian system is working well around the Souss-Massa National Park, which is crucial for the conservation of the last viable wild population of Northern Bald Ibis *Geronticus eremita*, a Critically Endangered species. Here, a conservation project has been underway to protect the birds at their breeding site and in surrounding areas. As Souss-Massa is a formally protect area, the government (HCEFLCD) is closely involved in managing the guards. At Sidi Bou Ghaba, there is a natural reserve where local guards have been under the employ of a non-governmental organisation. A local guardian system is thus a mechanism that can work in Morocco, and thus should be perfectly feasible for the Great Bustard areas. However, such a system would no doubt benefit from a recognised protection status of the key sites, whilst decisions would be needed as to whether the government or civil society would manage/coordinate a network of local guardians.

6.3.2 Strategy 2 – Minimise power line collisions and impacts from other infrastructure

a. Minimise power line collisions

Whilst it is hard to quantify the impact of power line collisions on Great Bustards in Morocco due to a lack of collision monitoring, this threat is known to be the main non-natural mortality cause in this species (Alonso *et al.* 2003, Martín *et al.* 2004). The Moroccan population is so critically low that even the loss of one adult bustard per year to collision could



Power line across a floodplain where Great Bustards used to be found in Kanouat (photo © Tim Dodman).



Construction of the high-speed railway line through Tendafel (photo © Tim Dodman).

negatively impact the population. Meanwhile, expansion of the national power line network in Morocco has been intensive, including across the remaining Great Bustard areas, so the potential for collisions is very high, given the presence of power lines in sensitive areas, where bustards have been seen in flight. Most respondents considered that it would be well worthwhile marking the most sensitive power lines with anti-collision devices to make them more visible to Great Bustards. Such devices, when placed appropriately, can contribute to reduced bird mortality (e.g. Alonso *et al.* 1994, Barrientos *et al.* 2011 and 2012). However, the most critical sectors of power lines crossing the central areas of leks should either be buried or removed and rerouted. Although expensive, underground cabling is the only way to reliably prevent collisions when wires must cross through core areas. Funding for all power line collision mitigation actions should be sourced urgently, e.g. via the electrical companies, government and private or international funding sources. Burying, rerouting and marking lines should be planned in close consultation with Office National de l'Électricité (ONE, National Electricity Office).

In addition, it should be possible to prevent new potentially harmful infrastructural developments in Great Bustard areas, such as new power lines and potentially wind turbines or other developments. Professional independent Environmental Impact Assessments should be conducted during feasibility studies for all developments.

b. Minimise impacts from other infrastructure

The high-speed train, the Ligne de Train à Grande Vitesse (LGV) or Train à Grande Vitesse (TGV) that is currently being constructed from Tangier southwards to Kénitra (eventually planned to reach Casablanca) passes directly through the probably former Great Bustard area of Tendafel and parts of Araoua. Other infrastructural developments underway include roads and water pipes, whilst wind turbines are a common feature on hills further north, which impact migratory soaring birds. Bird strikes with high-speed rail lines can represent an important factor of human-induced mortality for Great Bustards; 18 Great Bustards were killed in a 22 km length of a high-speed rail line that crosses a bustard distribution area in central Spain (Life Impacto Cero 2014). Whilst the TGV may pose a direct threat to Great Bustards, it inevitably also contributes to carving up habitat, i.e. fragmentation, whilst disturbance may be a further impacting factor. There is an agreement between the government and LGV for three years, which should allow for financing a study and potentially other activities on the Great Bustard. However, the Office National des Chemins de Fer (ONCF, National Railways Office) has not furthered the agreement yet. This needs to be resolved urgently as a key potential source of funds.

6.3.3 Strategy 3 – Secure bustard habitat in key areas

It seems that the only existing viable leks in 2015 are at Araoua and possibly at Tleta-Rissana. However, neither area benefits from designation for site conservation. It is essential to investigate this issue and identify the most appropriate realistic designations for these two areas and potentially for other areas where bustards were found until recently, especially given the goal of expanding the Great Bustard's range.

It is not possible to define within this plan the exact measure of designation required, as this requires a proper consultative process, with local stakeholder workshops (within the areas) and negotiations between government, local communities and civil society. However, it seems feasible to review and potentially change existing SIBE boundaries and to look into alternative, stronger, measures of site protection through legislation introduced in 2010.

The Plan Maroc Vert (Green Morocco Plan)² should also be better implemented to encourage a mosaic and diversity of habitats and to promote organic agriculture. It will be vital for the Great Bustard's survival to maintain the habitat at Araoua and prevent any significant agricultural development. Tleta-Rissana appears to be more modified, with large parts in danger of becoming dominated by monoculture. It is likely necessary for this area to set some fields aside and return them to a more traditional management style.

6.3.4 Strategy 4 Strengthen awareness and valuation

Some awareness activities have been undertaken in the past. However, it was widely felt that awareness activities alone were not useful, and needed to be backed up by surveillance and conservation action. For instance, some large posters remain on the main highway (autoroute) featuring bustards, but it is questionable if they serve a useful purpose unless conservation actions are underway. Some respondents thought such advertising might have even attracted hunters to the area, keen to shoot a Great Bustard.

Nevertheless, a targeted awareness campaign is an essential component of a Great Bustard conservation programme, especially to engage local people, local hunting groups and decision makers.



A poster encouraging protection of the Great Bustard in Morocco. These and other awareness materials were developed and distributed locally between 2000 and 2003 within the framework of the project “Viabilidad de la población de Avutardas de Marruecos. Bases científicas para su conservación (2000-2003)” funded by the Agencia Española de Cooperación Internacional para el Desarrollo (AECID), Ministry of Foreign Affairs of Spain (Alonso 2004).

Another important factor linked to awareness is to build valuation of the Great Bustard, both its cultural value and economic value. There are various options that could be developed to contribute to this, including:

- **Great Bustard ecotourism**
 - ◆ There is interest in developing Great Bustard ecotourism, especially including the bustard area in a birding circuit of (northern) Morocco.
 - ◆ Some stakeholders recommend construction of hides or observation areas, though any such structure would need to be a good distance from any lek to ensure there was no disturbance.
 - ◆ The Great Bustard is not an easy bird to see, so tourism may only appeal to the more ‘dedicated’ birdwatchers.
- **Great Bustard mark**
 - ◆ One option for bringing in resources would be to develop a Great Bustard mark, especially for quality traditional agricultural products, such as local cheese, wheat and broad beans.
 - ◆ Branding can add value to goods and generate markets.

² The Plan Maroc Vert is an agricultural development strategy led by the Department of Agriculture, which aims to promote a harmonious and balanced rural development that preserves social and economic balance whilst ensuring growth and efficiency.



Rolling hills and valleys and a mosaic of habitats in an agricultural landscape make up the area of Araoua, the only remaining stronghold for Great Bustard in Morocco (photo © Tim Dodman).

6.3.5 Strategy 5 Research and monitoring

A number of questions remain unanswered concerning the conservation management needs of the Great Bustard in Morocco. Of priority is to carry out accurate annual censuses of the population during the courtship / lekking season, when birds gather for ritual courtship displays and mating. Such surveys have been carried out in the past, so direct comparisons may be made to determine the population trend. Collision / casualty monitoring should also be conducted regularly to monitor the impact of power lines and other infrastructure. All monitoring results need to be readily available and analysed in order to inform and, where necessary, revise conservation management actions.

However, little is known about the movements and utilisation of habitat outside this season. It may be expected, for instance, that bustards move out of some agricultural areas, especially when crops are cut and cover diminished. There is potential to investigate movements and habitat use through a range of methods, and to obtain a much better idea of distribution and habitat use throughout the year.

Overall, an integrated research programme should be developed, ideally with the support and involvement of partners in Spain, notably the Museo Nacional de Ciencias Naturales, Consejo Superior de Investigaciones Científicas (CSIC) of Madrid (team currently led by Prof. J.C. Alonso). A capacity building element should be included, in order to build experience and confidence of a Moroccan team, who can carry out research and monitoring throughout the year, following on from past monitoring and the project “Viabilidad de la población de Avutardas de Marruecos. Bases científicas para su conservación (2000-2003).” The research programme should consider the option of implementing a population reinforcement plan through the release of young bustards, e.g. by collecting eggs in Spain and incubation and release in Morocco; this is not included within the current strategy, but may be a required future action.

6.3.6 Strategy 6 Sustainable funding

Short-term funding requirements may be met partially through the agreement between HCEFLCD and the LGV, whilst the IUCN Centre for Mediterranean Cooperation may be in a position to support searching funds for a pilot project to implement a part of the action plan. However, sustainable funding needs to be identified for the mid-term and long-term.

6.4 Strategic Objectives

During the stakeholder workshop, six objectives were set and translated into Long-term and Strategic Objectives (Table 3).

Table 3. Long-term and Strategic Objectives (LTO) for conservation of Great Bustards in northwest Morocco

Intervention Strategy	Long-term and Strategic Objectives (LTO)
S1 – Establish surveillance capacity	<p><i>LTO: By 2025, effective surveillance and in-situ monitoring have enabled the Great Bustard population in Morocco to increase by 25%.</i></p> <ol style="list-style-type: none"> 1. By 2017, local <i>écogardes</i> are recruited backed up by an effective coordination unit. 2. By 2018, all leks are safeguarded from illegal hunters and legislation implemented. 3. By 2018, all communities and hunters active in northwest Morocco are fully aware of the protected status of Great Bustard. 4. By 2020, sustainable mechanisms are in place to minimise collisions and control illegal wildlife hunting in Araoua and Tleta-Rissana, and to prevent Great Bustard poaching in all areas.
S2 – Minimise power line collisions and impacts from other infrastructure	<p><i>LTO: By 2025, the risk of Great Bustard collision with power lines is minimised and the impacts of transport and other infrastructure diminished.</i></p> <ol style="list-style-type: none"> 1. By 2017, agreements are in place to remove or mark existing power lines in Araoua and Tleta-Rissana and that no new power lines will traverse leks. 2. By 2018, the main 'problem power lines' in Araoua and Tleta-Rissana have been removed, with markers placed on all other lines within bustard habitat in these areas. 3. By 2019, agreements are in place to minimise potential risk of collisions in Tendafel, Kanouat and Chekbouchan. 4. By 2020, collisions of Great Bustards with power lines are no longer a threat in key areas. 5. By 2020, the negative impacts of road, rail and other infrastructure are diminished.
S3 – Secure habitat in key bustard areas	<p><i>LTO: By 2025, Great Bustards are breeding successfully in Araoua and Tleta-Rissana and have returned to at least two additional lek areas.</i></p> <ol style="list-style-type: none"> 1. By 2017, clear new designations have been established and formalised for Araoua and Tleta-Rissana based on their status as essential areas for Great Bustard survival in Morocco. 2. By 2018, mechanisms and incentives are in place to promote the 'Plan Maroc Vert' in all current and former Great Bustard lek areas. 3. By 2018, agreements are being implemented to secure a mosaic of habitats that benefit Great Bustards in Araoua and Tleta-Rissana. 4. By 2020, agreements have been reached to reinstate Tendafel, Kanouat and Chekbouchan as potential lek areas with appropriate undisturbed habitat available.
S4 – Strengthen awareness and valuation	<p><i>LTO: By 2025, rural communities in northwest Morocco are benefiting from an increasing population of Great Bustards through sustainable economic enterprises.</i></p> <ol style="list-style-type: none"> 1. By 2017, inhabitants in Araoua and Tleta-Rissana are aware about the vital role of their land to save the Great Bustard in Morocco, about new conservation measures underway and the need to minimise disturbance. 2. By 2019, awareness of Great Bustard conservation measures is entrenched within public institutions, especially schools. 3. By 2020, a community-based economic incentives programme is underway, likely to include branding of 'Great Bustard' products. 4. By 2020, low-level ecotourism initiatives are under operation that feature Great Bustards in their itinerary.
S5 – Research and monitoring	<p><i>LTO: By 2025, effective research and monitoring of population trends, behaviour, movements, habitat requirements and other parameters have yielded conservation solutions, enabling the Great Bustard population to increase.</i></p> <ol style="list-style-type: none"> 1. 2016-2025: Censuses of Great Bustards (and sex ratios) in Araoua and Tleta-Rissana are conducted annually during early spring, and every three years across all leks to determine population trends. 2. 2016-2025: A casualty transect monitoring programme is established and implemented to monitor bird casualties caused by power lines in all lek areas. 3. By 2017, a programme of integrated research is established to investigate the conservation status of Great Bustards throughout the year, including behaviour, movements and habitat requirements. 4. By 2018, all identified actual and potential threats are being monitored. 5. By 2018, there is good local capacity to conduct censuses and research.
S6 – Sustainable funding	<p><i>LTO: By 2025, Great Bustard conservation in Morocco is assured through secured sustainable financing mechanisms.</i></p> <ol style="list-style-type: none"> 1. In 2016, the agreement between HCEFLCD and the LGV is functional and funds are available for immediate mitigating actions. 2. By 2017, additional external funds and partnerships are in place, especially to address priority issues of poaching and collisions. 3. By 2018, government commitments are secured for long-term financing of local surveillance. 4. By 2020, Great Bustard conservation is fully integrated into annual government budgets.

7. Conservation Action Plan

Table 4. Prioritised actions with timescales, responsibilities and approximate costs for implementing the Action Plan

Strategic Objective	Action	Priority	Timescale	Organisations / persons responsible	Cost (Low, Medium, High)	Notes
S1 – Establish surveillance capacity						
LTO By 2025, effective surveillance and in-situ monitoring have enabled the Great Bustard population in Morocco to increase by 25%.						
1. By 2017, local <i>écogardes</i> are recruited backed up by an effective coordination unit.	1.1 Identify and recruit project coordinator and assistant	★★★	By end 2016	HCEFLCD, in coordination with GREPOM	High	Meetings to determine if staff of HCEFLCD or GREPOM
	1.2 Recruit 2-10 <i>écogardes</i> to guard leks and breeding areas and monitor collisions	★★★	By February 2017	HCEFLCD, in coordination with GREPOM	High	<i>Écogardes</i> drawn from local communities of Araoua and Tleta-Rissana
	1.3 Mobilise resources for effective surveillance (especially to control poaching and disturbance), censuses and collision monitoring	★★★	By end 2017	HCEFLCD, in coordination with GREPOM; seek external support	High	Transport (4WD / motorbike, bicycles), phones, telescope / binoculars / uniforms and boots
	1.4 Establish a physical centre / presence in Araoua	★★	By 2018	HCEFLCD, in coordination with GREPOM; seek external support	Medium	The project needs a local centre / office; key staff may also need accommodation provided
2. By 2018, all leks are safeguarded from illegal hunters and legislation implemented.	2.1 Maintain a permanent surveillance of lek areas from February to April each year	★★★	By March 2018, then every spring	Project Coordinator	Low	<i>Écogarde</i> rotas, effective coordination
	2.2 A good informer network is established to report on bustard observations and locations, collision incidents and any suspicious actions.	★★★	By March 2018, then ongoing growth	Project Coordinator and <i>écogardes</i>	Low	Local <i>écogarde</i> system encourages local informers
	2.3 Legislation / judicial system is reviewed to establish tough sentences	★★	By end 2018	HCEFLCD / GREPOM with legislature, courts and local politicians	Low	Awareness of tough sentences should deter poachers
3. By 2018, all communities and hunters active in northwest Morocco are fully aware of the protected status of Great Bustard.	3.1 Establish local boards to guide the project, with places for community leaders and local hunting groups	★★	Start in 2016/17, then ongoing	HCEFLCD / GREPOM, Project Coordinator	Low	Community and hunter presence on local bustard management boards (Araoua and Tleta-Rissana) improves relations
	3.2 Local hunting groups actively deter illegal hunting during their <i>amodiation</i> in all (former) lek areas	★★	By 2017, then ongoing	Project Coordinator, in cooperation with local hunting groups	Low	Local hunting groups usually employ their own guards to control their hunting <i>amodiation</i> (lease agreement)
	3.3 Extend awareness programmes of S4 1.1-1.3 to include local and other hunters, including information on penalties for hunting	★★	By 2018, then ongoing	Project Coordinator, in cooperation with HCEFLD and local hunting groups	Low	Hunters especially need to be well aware about the protected status of the Great Bustard and penalties for hunting. <i>Écogarde</i> presence should deter hunting

Strategic Objective	Action	Priority	Timescale	Organisations / persons responsible	Cost (Low, Medium, High)	Notes
4. By 2020, sustainable mechanisms are in place to minimise collisions and control illegal wildlife hunting in Araoua and Tleta-Rissana, and to prevent Great Bustard poaching in all areas.	4.1 Surveillance programme is adopted fully by government for long-term implementation	★★	By March 2020	HCEFLCD, in coordination with GREPOM	Low	Government integrates surveillance into regular annual programme
	4.2 Train all project staff and community members	★★★★	Start in 2017, then ongoing	HCEFLCD, in coordination with GREPOM	Medium	Essential to train <i>écogardes</i> in surveillance / monitoring
	4.3 Extend surveillance system to Tendafel, Kanouat and Chekbouchan	★★	By 2020	HCEFLCD, in coordination with GREPOM	High	Surveillance of all hunting activities. Recruitment of extra local <i>écogardes</i> for new areas
S2 – Minimise power line collisions and impacts from other infrastructure						
LTO By 2025, the risk of Great Bustard collision with power lines is minimised and the impacts of transport and other infrastructure diminished						
1. By 2017, agreements are in place to remove or mark existing power lines in Araoua and Tleta-Rissana and that no new power lines will traverse leks.	1.1 Review the power line infrastructure, confirm 'no power line zones' and develop a collision mitigation plan for all bustard areas	★★★★	By end 2016	HCEFLCD and ONE with Project Coordinator and stakeholder participation; CSIC	Medium	Invite expertise from Europe (where collision mitigation has been achieved in some areas). CSIC has already carried out useful analysis (Palacín <i>et al.</i> 2016)
	1.2 Develop and sign agreement with ONE to remove 'problem power lines'	★★★★	By June 2017	HCEFLCD and ONE	Low	Convention should be a legally binding inter-ministerial document
	1.3 Develop and sign convention with ONE to prevent new power lines cutting across bustard habitat	★★★★	By June 2017	HCEFLCD and ONE	Low	Agreement should be a legally binding inter-ministerial document
2. By 2018, the main 'problem power lines' in Araoua and Tleta-Rissana have been removed, with markers placed on all other lines within bustard habitat in these areas.	2.1 Analyse all power lines and identify and prioritise those that require removal (rerouting or underground cabling) or anti-collision devices/markers	★★★★	By end 2016	Project Coordinator; CSIC	Low	Invite experts from Europe to assist with field work and analysis. Removal of power lines includes replacement by alternative routes and burying cables underground
	2.2 Work with experienced partners to identify suitable methods for removing power lines (underground cabling or rerouting) and marking wires, and develop a timetable and budget	★★★★	By March 2017	Project Coordinator with external support	Medium	Work with partners in Europe on a technical level; determine actions required to effectively mitigate collisions; develop funding proposal to implement actions
	2.3 Remove 'problem power lines' through rerouting or underground cabling	★★★★	Commence urgently; complete priority lines by June 2018, others by end 2018	HCEFLCD and ONE; external partners	High	Raise funds and identify international partners to support this urgent activity
	2.4 Equip power lines not being removed with anti-collision devices/markers	★★★	Commence urgently; complete priority lines by June 2018, others by end 2018	HCEFLCD and ONE	High	This activity could be completed earlier if analyses concluded and partners found

Strategic Objective	Action	Priority	Timescale	Organisations / persons responsible	Cost (Low, Medium, High)	Notes
3. By 2019, agreements are in place to minimise potential risk of collisions in Tendafel, Kanouat and Chekbouchan.	3.1 Review the power line networks, assess their potential impacts and develop mitigation options	★★★	By June 2017	HCEFLCD and ONE; external advice from Bustard SG and CSIC	Medium	This will involve field work to identify problem lines and prioritise those for marking, plus meetings with ONE
	3.2 Agree mitigating options with ONE, then develop and sign convention to implement mitigation measures	★★★	2018-2019	HCEFLCD and ONE	Low; High for implementing	The convention should follow / adopt the collision mitigation plan and will need an agreed budget and identified support
4. By 2020, collisions of Great Bustards with power lines are no longer a threat in key areas.	4.1 <i>Écogardes</i> regularly monitor power lines and check for any bird collisions	★★★	By 2017, then ongoing	HCEFLCD / GREPOM	Low	Link to S1 4.2 (training of <i>écogardes</i>) and S5 (collision monitoring)
	4.2 Assess, review and adapt collision mitigation plan and ensure no 'problem power lines' remain	★★★	By 2020	Project Coordinator with external partners	Medium	Review monitoring results to determine if any problem power lines remain. Expertise available in Europe
5. By 2020, the negative impacts of road, rail and other infrastructure are diminished.	5.1 Review transport networks and other infrastructure, assess their potential impacts and develop mitigation options	★★	By 2017, then ongoing	Project Coordinator, with input from HCEFLCD / GREPOM / METL / ONCF / ADM; CSIC / Bustard SG to advise	Medium	All aspects should be considered, including fragmentation of landscape and disturbance, and budget. CSIC has already carried out useful analysis (Palacin <i>et al.</i> 2016)
	5.2 Implement mitigation options where all infrastructure may negatively impact Great Bustards	★★ (adapt to results of 5.1)	From 2017, then ongoing	Project Coordinator, with input from HCEFLCD / GREPOM / METL / ONCF / ADM; CSIC / Bustard SG to advise	potentially High	Some high-speed rail lines have high impacts in Spain; after review (5.1) some urgent actions may be recommended
	5.3 Ensure effective independent EIAs are carried out before all future developments	★★	2016-2025	Project Coordinator / HCEFLCD / GREPOM	Low	An ongoing activity; project will need to build up lobbying capacity and forge links

Strategic Objective	Action	Priority	Timescale	Organisations / persons responsible	Cost (Low, Medium, High)	Notes
S3 – Secure habitat in key bustard areas						
<i>LTO By 2025, Great Bustards are breeding successfully in Araoua and Tleta-Rissana and have returned to at least two additional lek areas.</i>						
1. By 2017, clear new designations have been established and formalised for Araoua and Tleta-Rissana based on their status as essential areas for Great Bustard survival in Morocco.	1.1 Review current designations in relation to protection level afforded and core bustard areas and draw up new boundaries / proposals for designation	★★★	2016/17	HCEFLCD / GREPOM	Medium	HCEFLCD needs to lead this process with strong involvement of its regional offices
	1.2 Hold a series of stakeholder meetings in Araoua and Tleta-Rissana to discuss and decide upon appropriate designations	★★★	2016/17	Project Coordinator / HCEFLCD / GREPOM	Medium	Local stakeholder agreement will be essential, and stakeholders must have an opportunity to influence plans
	1.3 Launch formal designation process and see through their adoption into legislation.	★★★	2017	Project Coordinator / HCEFLCD / GREPOM	Low	Binding designations are needed that pass through legislation / judicial process
2. By 2018, mechanisms and incentives are in place to promote the 'Plan Maroc Vert' in all current and former Great Bustard lek areas.	2.1 Inter-ministerial meetings at regional level to identify means and incentives to actively promote the 'Plan Maroc Vert' in all bustard areas	★★	2016-2017	Project Coordinator / MAPM / HCEFLCD	Low	This activity should run mostly in parallel with S3 1.1-1.3. The project will work closely with MAPM at national, regional and local levels
	2.2 Community-based stakeholder meetings to promote the 'Plan Maroc Vert'	★★	2016-2017	Project Coordinator / MAPM / HCEFLCD	Low	Local stakeholder input is essential; close engagement of local government offices
	2.3 Mechanisms in place for financial / other incentives for retaining / adopting traditional farming methods	★★	By 2018, thence ongoing	Project Coordinator / MAPM / HCEFLCD	Low	Incentives will be linked closely to the strategy and regional agricultural plans of the Plan Maroc Vert
3. By 2018, agreements are being implemented to secure a mosaic of habitats that benefit Great Bustards in Araoua and Tleta-Rissana.	3.1 Community stakeholder meetings and extension in Araoua and Tleta-Rissana to engage / interest farmers and shepherds in bustard-friendly farming	★★	2016-2017	Project Coordinator / MAPM / HCEFLCD	Medium	This activity will run mostly in parallel with S3 1.1-1.3 and 2.1-2.3. The project will work closely with MAPM at the local level; incentives need to be identified
	3.2 Agreements secured with farmers / proprietors in Araoua and Tleta-Rissana to secure suitable habitats for bustards, including year-round cover	★★	2016-2018	Project Coordinator / MAPM / HCEFLCD	Medium	Type of agreement to be decided locally; agreements should not carry punitive elements but operate rather through positive incentives
	3.3 Bustard-friendly farming and grazing methods are implemented including minimising disturbance, mowing breeding fields later and retaining year-round cover	★★★	By 2018/19, thence ongoing	Project Coordinator / MAPM / HCEFLCD	High	This is the main implementing activity on the ground for S3 2 and 3, with active habitat management mainly by land proprietors / owners

Strategic Objective	Action	Priority	Timescale	Organisations / persons responsible	Cost (Low, Medium, High)	Notes
4. By 2020, agreements have been reached to reinstate Tendafel, Kanouat and Chekbouchan as potential lek areas with appropriate undisturbed habitat available.	4.1 Community stakeholder meetings in Tendafel, Kanouat and Chekbouchan to promote and discuss bustard-friendly farming	★	2018-2019	Project Coordinator / MAPM / HCEFLCD	Low	This activity will run follow on from S3 2.1-2.3. The project will work closely with MAPM at the local level; incentives need to be identified
	4.2 Agreements secured with farmers / proprietors in Tendafel, Kanouat and Chekbouchan to secure suitable habitats for bustards, including year-round cover	★	2018-2019	Project Coordinator / MAPM / HCEFLCD	Low	Type of agreement to be decided locally; agreements should not carry punitive elements but operate rather through positive incentives
	4.3 Bustard-friendly farming and grazing methods are implemented including minimising disturbance, mowing breeding areas later and retaining year-round cover	★	By 2020, thence ongoing	Project Coordinator / MAPM / HCEFLCD	High	Habitat management mainly by land proprietors / owners
S4 – Strengthen awareness and valuation						
<i>LTO By 2025, rural communities in northwest Morocco are benefiting from an increasing population of Great Bustards through sustainable economic enterprises.</i>						
1. By 2017, inhabitants in Araoua and Tleta-Rissana are aware about the vital role of their land to save the Great Bustard in Morocco, about new conservation measures underway and the need to minimise disturbance.	1.1 Devise and launch an awareness campaign throughout the key bustard areas.	★★★	2016/17, thence ongoing	Project Coordinator	Medium	Target groups should include land managers, farmers, shepherds, local decision makers and young people
	1.2 Establish community-based 'Great Bustard associations' in Araoua and Tleta-Rissana	★★★	2016/17	Project Coordinator	Low	Associations should be community-led, but with some resources available for functioning via the project
	1.3 Hold public meetings and events (e.g. Great Bustard Days) focused on the Great Bustard and on project activities	★★	2016-2017, thence ongoing	Project Coordinator	Medium	Local communities need to be strongly aware of the project and be updated about progress
	1.4 Develop agreements and actions to minimise disturbance to bustards, especially from farm and feral dogs	★★	2017, thence ongoing	Project Coordinator	Medium	Disturbance should be kept to a minimum, especially during courtship and breeding, and steps taken to reduce the threat of dogs (as potential predators)
	1.5 Investigate options to establish a Great Bustard 'centre', with interpretation and other facilities and sale of products	★	2016-2018	Project Coordinator / Great Bustard associations / GREPOM / HCEFLCD	Medium (High for establishing centre)	Consider alongside need for a project centre (S1 1.4), also potential for bird-viewing hides. Potential venue for sale of products from S4 3 and 4
2. By 2019, awareness of Great Bustard conservation measures is entrenched within public institutions, especially schools.	2.1 Develop materials and methods for effective bustard awareness activities in local schools	★★	2016/17, thence ongoing and adapting	Project Coordinator, local educators	Medium	Some teachers have already been active in conservation activities and Great Bustard awareness
	2.2 Hold meetings with relevant government institutions and offices, e.g. agriculture, development, infrastructure	★★	2016-2017, thence ongoing	Project Coordinator	Low	The project's presence needs to be felt keenly in local government offices and be known by staff, e.g. agricultural extension officers
	2.3 Build Great Bustard initiatives into institutes of higher learning (universities / colleges)	★★	2017-2019, thence ongoing	Project Coordinator / GREPOM / ENA	Low	The project should attract studies from universities, and colleges, such as ENA (in Meknès)

Strategic Objective	Action	Priority	Timescale	Organisations / persons responsible	Cost (Low, Medium, High)	Notes
3. By 2020, a community-based economic incentives programme is underway, likely to include branding of 'Great Bustard' products.	3.1 Through active community consultation and lead, develop sustainable economic incentives based around the Great Bustard	★★★	2017-2018	Great Bustard associations / Project Coordinator, in consultation with MAPM and HCEFLCD	Medium	A series of meetings will be needed to identify the most promising and best-supported incentives
	3.2 Encourage Great Bustard branding linked to products of sustainable 'bustard-friendly' farming	★★	2017-2019	Great Bustard associations / Project Coordinator, in consultation with MAPM and HCEFLCD	Medium	Branding is one definite option that deserves special attention, linked to Plan Maroc Vert products from bustard areas
	3.3 Launch Great Bustard products and build awareness (market outreach, community buy-in etc.)	★★	2019- 2020, thence ongoing	Great Bustard associations / Project Coordinator, in consultation with MAPM and HCEFLCD	Medium	Products will need good marketing, with professional support for this and other aspects
4. By 2020, low-level ecotourism initiatives are under operation that feature Great Bustards in their itinerary.	4.1 Explore options for low-level tourism in Araoua that features the Great Bustard	★	2017	Project Coordinator / HCEFLCD / GREPOM / CSIC	Low	Consider wider ecotourism potential, e.g. culture (Zelis), hiking, local products
	4.2 Develop protocols and guidelines for ecotourism	★	2017	HCEFLCD / GREPOM / CSIC	Low	CSIC could provide good advice from Spanish experience
	4.3 Build Great Bustard into (northwest) Morocco birding circuits	★	2018-2019, thence ongoing	HCEFLCD / GREPOM / Project Coordinator	Low	Birding is increasingly popular in Morocco; strong potential to promote the project area
	4.4 Establish mechanisms for community benefits from ecotourism operations	★	2019-2020, thence ongoing	HCEFLCD / GREPOM / Project Coordinator and Great Bustard associations	Low	Need to ensure that all ecotourism operations yield community benefits
S5 – Research and monitoring						
<i>LTO By 2025, effective research and monitoring of population trends, behaviour, movements, habitat requirements and other parameters have yielded conservation solutions, enabling the Great Bustard population to increase.</i>						
1. 2016-2025: Censuses of Great Bustards (and sex ratios) in Araoua and Tleta-Rissana are conducted annually during early spring, and every three years across all leks to determine population trends.	1.1 Develop protocols and guidelines for Great Bustard spring censuses	★★	2016	CSIC / GREPOM / HCEFLCD	Low	CSIC has strong experience of organising the census, with local coordination
	1.2 Conduct spring censuses annually in Araoua and Tleta-Rissana and every three years across all (former) leks	★★★	Annually / ongoing	Project Coordinator, with guidance and at times direct involvement of CSIC	Medium	Census teams to include personnel of HCEFLCD, GREPOM and local <i>écogardes</i> ; CSIC to continue their support
	1.3 Prepare concise annual census reports with analyses	★★★	By May each year	Project Coordinator	Low	Reports need to be timely to guide conservation action
2. 2016-2025: A casualty transect monitoring programme is established and implemented, to monitor bird casualties caused by power lines in all lek areas.	2.1 Develop a casualty transect monitoring programme and train <i>écogarde</i> capacity to implement monitoring	★★	2016/17	CSIC / GREPOM / HCEFLCD	Low	CSIC has strong experience of carrying out such monitoring in Spain, and could provide technical support
	2.2 Implement monitoring according to the casualty transect monitoring programme	★★★	Ongoing, according to timetable in programme	Project Coordinator, with guidance of CSIC	Medium	Monitoring to be conducted by local <i>écogardes</i> ; CSIC to continue their support

Strategic Objective	Action	Priority	Timescale	Organisations / persons responsible	Cost (Low, Medium, High)	Notes
3. By 2017, a programme of integrated research is established to investigate the conservation status of Great Bustards throughout the year, including behaviour, movements and habitat requirements.	3.1 Hold a small technical workshop to develop an integrated research programme and identify actors	★★	2016/17	HCEFLCD / GREPOM / CSIC	Medium	Engage universities and colleges (e.g. agricultural college), alongside existing partners
	3.2 Launch / circulate an integrated research programme and liaise with partners to fund-raise for its implementation and adopt components of the plan	★★	2017	HCEFLCD / GREPOM / CSIC; input from Bustard SG	Low	Consider building in local PhD positions for longer-term studies of bustard behaviour / movements, also socio-economic research linked to traditional agriculture
	3.3 Launch research activities as separate components	★★	By 2017/18, thence ongoing	HCEFLCD / GREPOM / Research partners	Medium - High (depends on activities)	Separating components may be more sustainable and encourage diversity of partners
4. By 2018, all identified actual and potential threats are being monitored.	4.1 Ensure all potential threats are monitored throughout the year in Araoua and Tleta-Rissana, including changes in land use and infrastructure	★★★	By 2017/18, thence ongoing	Project Coordinator, with <i>écogardes</i>	Medium	As far as possible, monitor out-of-season hunting, disturbance, loss of cover, collisions, etc. Also monitor changes in land use (farms / farming practices) and infrastructure (power lines / transport links)
	4.2 Monitor potential threats through site visits and interviews in five other (former) leks	★★	By 2017/18, thence ongoing	Project Coordinator, with <i>écogardes</i>	Medium	As far as possible, monitor out-of-season hunting, disturbance, loss of cover, collisions, etc.
5. By 2018, there is good local capacity to conduct censuses and research.	5.1 Organise and carry out a training programme for <i>écogardes</i> and others directly involved in the project in census and components of research	★★★	Develop programme in 2017; conduct annual training thence	Project Coordinator, with support from HCEFLCD / GREPOM / CSIC	Medium	Strong local capacity is needed for a sustainable programme of censuses and research; <i>écogardes</i> in particular need reliable field skills
	5.2 Ensure <i>écogardes</i> and other trainees participate in censuses and other research activities	★★★	2017 onwards	Project Coordinator	Low	Multi-agency teams with good involvement of local stakeholders
	5.3 Provide advanced training for Coordinator or research assistant for effective technical capacity within the project	★★	2017 onwards; certification by 2018/19	Project Coordinator, with support from HCEFLCD / GREPOM / CSIC	Medium	Advance research capacity on the ground is necessary to enable an efficient and adaptable conservation programme
S6 – Sustainable funding						
LTO: By 2025, Great Bustard conservation in Morocco is assured through secured sustainable financing mechanisms.						
1. In 2016, the agreement between HCEFLCD and the LGV is functional and funds are available for immediate mitigating actions.	1.1 Realise the HCEFLCD-LGV agreement and link directly to this action plan for implementation of urgent actions	★★★	2016; secure funds up to end 2018 at least	HCEFLCD / LGV	Low	This agreement is signed but not being implemented yet
	1.2 Establish project board or steering group to monitor actions and use of funds	★★	2016	HCEFLCD / GREPOM / LGV	Low	A group should be set up to guide project management and wise use of funds
	1.3 Prepare information materials and reports highlighting the collaboration and support of LGV	★★	2016-2018	Project Coordinator	Low	Efficient information sharing and reporting may attract follow-up support

Strategic Objective	Action	Priority	Timescale	Organisations / persons responsible	Cost (Low, Medium, High)	Notes
2. By 2017, additional external funds and partnerships are in place, especially to address priority issues of poaching and collisions.	2.1 Circulate the action plan and approach potential donors for support of priority actions	★★★	2016 and 2017, ongoing	Project Coordinator	Low	Wide targeted circulation of the action plan in English and French should yield success
	2.2 Investigate options for follow-up support through the IUCN Centre for Mediterranean Cooperation	★★	2016-2017	Project Coordinator	Low	There should be some institutional interest of partners that supported the development of the action plan
	2.3 Investigate options for twinning arrangements, e.g. with Great Bustard areas in Spain	★	2016-2017	Project Coordinator / GREPOM	Low	Twinning arrangements have awareness and exchange benefits, but may also promote additional support and finance
3. By 2018, government commitments are secured for long-term financing of local surveillance.	3.1 During the LGV support phase, hold meetings to secure governmental commitment of finances beyond 2018	★★★	2016-2018	Project Coordinator / HCEFLCD / GREPOM	Low	Government financial support is especially relevant for the coordination unit and <i>écogardes</i>
4. By 2020, Great Bustard conservation is fully integrated into annual government budgets.	4.1 Hold meetings and develop a framework and annual budget for integrating Great Bustard conservation into annual government budgets	★★	2017-2019	Project Coordinator / HCEFLCD / GREPOM	Medium	Meetings should involve different ministries, with HCEFLCD taking the lead
	4.2 Formally adopt Great Bustard conservation into government agenda and budget	★★★	2020, then ongoing	HCEFLCD	Low	Government should adopt the management of designated areas, surveillance and monitoring, which are all required long-term actions

Notes

- Priority scale. All actions described are of importance, according to the rankings below:

★★★★	Urgent High priority action:	of critical importance; needs immediate action, essential for success
★★★	High Priority action:	seriously important action, necessary for success
★★	Priority action:	important action, highly beneficial for success
★	Moderate Priority action:	useful action, beneficial for success

- Costs have been divided into categories, which have the following approximate values:

Category	Approximate Cost (Euros)
Low:	0 – 1,000
Medium:	1,000 – 10,000
High:	>10,000

These costs require review when starting up implementation of the action plan.

- The action plan should be reviewed every three years, i.e. in 2019 and 2022, with a review and development of a new plan early 2025.
- Establishment of a steering group is mentioned under action S6 1.2. It will be necessary to establish a group to provide technical and management guidance to the project. This could be a coordination committee, steering group or advisory board. The remit and make-up of the group should be decided locally during year 1. Most such groups become too costly to run and inefficient if they have more than ten members.

8. Monitoring Plan: Indicators and Means of Verification

Monitoring and evaluation are important components of any plan or project. Here, indicators and means of verification are presented for each strategic objective. The plan should be a flexible document, such that where some strategic objectives are not being met, then there is scope for review to ensure that objectives are met. Of course, the action plan is a plan and not a fully resourced project, so some objectives may not be met if resources are not identified to finance or support the proposed actions. Regular, e.g. annual monitoring of the action plan guided by the indicators and means of verification given will help the steering group (or equivalent) to prioritise new approaches for funding or other support.

Table 5. Indicators and Means of Verification for Action Plan Strategic Objectives

Strategic Objective	Indicators	Means of Verification
S1 – Establish surveillance capacity		
<i>LTO By 2025, effective surveillance has and in-situ monitoring enabled the Great Bustard population in Morocco to increase by 25%.</i>		
1. By 2017, local <i>écogardes</i> are recruited backed up by an effective coordination unit.	By 2018, effective well-resourced surveillance capacity in place, with coordination centre, unit and <i>écogardes</i>	<ul style="list-style-type: none"> Physical presence of centre, coordination staff and <i>écogardes</i> Terms of Reference and work programmes Surveillance reports
2. By 2018, all leks are safeguarded from illegal hunters and legislation implemented.	By 2018, leks functioning in Araoua and Tleta-Rissana without disturbance from hunters	<ul style="list-style-type: none"> Spring census reports Surveillance reports
3. By 2018, all communities and hunters active in northwest Morocco are fully aware of the protected status of Great Bustard.	Wide awareness of the Great Bustard status, especially in hunting circles	<ul style="list-style-type: none"> Project reports / meeting reports Interviews with hunters Awareness materials targeted at hunters
4. By 2020, sustainable mechanisms are in place to minimise collisions and control illegal wildlife hunting in Araoua and Tleta-Rissana, and to prevent Great Bustard poaching in all areas.	By 2020, well-controlled hunting operations in northwest Morocco, with absence of illegal hunting in all Great Bustard areas	<ul style="list-style-type: none"> Local hunting groups reports / agreements Surveillance and census reports Training records
S2 – Minimise power line collisions and impacts from other infrastructure		
<i>LTO By 2025, the risk of Great Bustard collision with power lines is minimised and the impacts of transport and other infrastructure diminished.</i>		
1. By 2017, agreements are in place to remove or mark existing power lines in Araoua and Tleta-Rissana and that no new power lines will traverse leks.	Permanent absence of power lines in core areas of Araoua and Tleta-Rissana, with all other power lines carrying anti-collision devices	<ul style="list-style-type: none"> Signed convention with delineation of 'no power line zones' Verify absence of power lines and presence of markers through site visits
2. By 2018, the main 'problem power lines' in Araoua and Tleta-Rissana have been removed, with markers placed on all other lines within bustard habitat in these areas.	By 2018, problem power lines removed, no new power lines installed and markers present on all other power lines contributing to minimised risk of collisions for Great Bustards and other birds	<ul style="list-style-type: none"> Verify removal of problem power lines, absence of new power lines and presence of markers through site visits to Araoua and Tleta-Rissana
3. By 2019, agreements are in place to minimise potential risk of collisions in Tendafel, Kanouat and Chekbouchan.	Agreement to mitigate collisions in place by 2019	<ul style="list-style-type: none"> Signed convention / agreement with plans for mitigating measures
4. By 2020, collisions of Great Bustards with power lines are no longer a threat in key areas.	No collisions of Great Bustards with power lines in key areas annually	<ul style="list-style-type: none"> Surveillance / monitoring reports
5. By 2020, the negative impacts of road, rail and other infrastructure are diminished.	By 2017, mitigation measures planned or in place on existing networks, where recommended; EIAs mandatory and carried out for all new developments, with Great Bustard issues taken into account	<ul style="list-style-type: none"> Project and transport convention reports Site visits with staff Published EIAs

Strategic Objective	Indicators	Means of Verification
S3 – Secure habitat in key bustard areas		
<i>LTO By 2025, Great Bustards are breeding successfully in Araoua and Tleta-Rissana and have returned to at least two additional lek areas.</i>		
1. By 2017, clear new designations have been established and formalised for Araoua and Tleta-Rissana based on their status as essential areas for Great Bustard survival in Morocco.	By 2017, new legal site designations in place with clearly demarcated site boundaries and conditions of use	<ul style="list-style-type: none"> • Government documents of formal designations
2. By 2018, mechanisms and incentives are in place to promote the 'Plan Maroc Vert' in all current and former Great Bustard lek areas.	By 2017, mechanisms in place under the 'Plan Maroc Vert' to promote traditional agriculture in northwest Morocco	<ul style="list-style-type: none"> • 'Plan Maroc Vert' documents and plans
3. By 2018, agreements are being implemented to secure a mosaic of habitats that benefit Great Bustards in Araoua and Tleta-Rissana.	By 2018, adoption of bustard-friendly farming methods in Araoua and Tleta-Rissana linked to the Plan Maroc Vert and additional agreements	<ul style="list-style-type: none"> • Site visits to traditional farms • Project and local meeting reports • Bustard monitoring reports (especially from breeding season)
4. By 2020, agreements have been reached to reinstate Tendafel, Kanouat and Chekbouchan as potential lek areas with appropriate undisturbed habitat available.	By 2020, agreements in place for adopting bustard-friendly farming in Tendafel, Kanouat and Chekbouchan	<ul style="list-style-type: none"> • Written local agreements • Meeting reports
S4 – Strengthen awareness and valuation		
<i>LTO By 2025, rural communities in northwest Morocco are benefiting from an increasing population of Great Bustards through sustainable economic enterprises.</i>		
1. By 2017, inhabitants in Araoua and Tleta-Rissana are aware about the vital role of their land to save the Great Bustard in Morocco, about new conservation measures underway and the need to minimise disturbance.	At least 75% of the population in Araoua and Tleta-Rissana are aware about the Great Bustard and measures to protect it by 2017	<ul style="list-style-type: none"> • Interviews • Meeting / campaign reports • Awareness materials
2. By 2019, awareness of Great Bustard conservation measures is entrenched within public institutions, especially schools.	All school pupils in project area are aware about Great Bustard conservation by 2018 High level of awareness about Great Bustards in government institutions and centres of learning	<ul style="list-style-type: none"> • School visits • Meetings with government agencies / colleges • Curricula, with Great Bustard featured • Interest in / adoption of Great Bustard / agricultural research
3. By 2020, a community-based economic incentives programme is underway, likely to include branding of 'Great Bustard' products.	By 2020, economic incentives / branding initiatives are underway, bringing 'bustard benefits' to local communities	<ul style="list-style-type: none"> • Economic incentive agreements • Great Bustard branded products • Project reports and minutes of local meetings
4. By 2020, low-level ecotourism initiatives are under operation that feature Great Bustards in their itinerary.	By 2020, low-level ecotourism initiatives in Araoua and Tleta-Rissana in particular are operating, bringing benefit to local communities	<ul style="list-style-type: none"> • Ecotourism schedules and tour reports • Advertised tour itineraries • Project reports, detailing ecotourism data and incomes
S5 – Research and monitoring		
<i>LTO By 2025, effective research and monitoring of population trends, behaviour, movements, habitat requirements and other parameters have yielded conservation solutions, enabling the Great Bustard population to increase.</i>		
1. 2016-2025: Censuses of Great Bustards (and sex ratios) in Araoua and Tleta-Rissana are conducted annually during early spring, and every three years across all leks to determine population trends.	Spring census data and population trend analyses available annually for contribution to management decisions	<ul style="list-style-type: none"> • Census reports
2. 2016-2025: A casualty transect monitoring programme is established and implemented, to monitor bird casualties caused by power lines in all lek areas.	Casualty transect monitoring programme underway, with results informing management and policy	<ul style="list-style-type: none"> • <i>Écogardes</i> trained in casualty transect monitoring • Transect monitoring field notes and results
3. By 2017, a programme of integrated research is established to investigate the conservation status of Great Bustards throughout the year, including behaviour, movements and habitat requirements.	By 2017/18, integrated research is underway and contributing data for management decisions	<ul style="list-style-type: none"> • Integrated research programme published • Individual research projects • Annually, research project results and papers
4. By 2018, all identified actual and potential threats are being monitored.	Great Bustard threats well known and documented through annual monitoring activities	<ul style="list-style-type: none"> • Monitoring reports and analyses
5. By 2018, there is good local capacity to conduct censuses and research.	By 2018, there is strong national and local expertise for Great Bustard research and monitoring; <i>écogardes</i> and other trainees have capacity to conduct censuses and research.	<ul style="list-style-type: none"> • Training programmes, reports and course evaluations • Trainee certificates • <i>Écogarde</i> annual work evaluations

Strategic Objective	Indicators	Means of Verification
S6 – Sustainable funding		
<i>LTO: By 2025, Great Bustard conservation in Morocco is assured through secured sustainable financing mechanisms.</i>		
1. In 2016, the agreement between HCEFLCD and the LGV is functional and funds are available for immediate mitigating actions.	Between 2016 and 2018, the LGV (ONCF) directly finances urgent Great Bustard conservation activities through a signed agreement between HCEFLCD and the LGV	<ul style="list-style-type: none"> • Signed convention / agreement with plans for mitigating measures • Annual project reports and finance reports
2. By 2017, additional external funds and partnerships are in place, especially to address priority issues of poaching and collisions.	By 2017, additional partnerships are forged and resources secured for Great Bustard conservation, which continue into the future	<ul style="list-style-type: none"> • Partnership agreements and new project documents • Agreed financing of components of the action plan • A potential twinning mechanism underway, with documentation and web presence
3. By 2018, government commitments are secured for long-term financing of local surveillance.	By 2018, the Moroccan government has committed to long-term financing of surveillance operations	<ul style="list-style-type: none"> • Government plans and protocols; local arrangements in place
4. By 2020, Great Bustard conservation is fully integrated into annual government budgets.	By 2020, the Moroccan government has fully integrated Great Bustard conservation into its annual budget and plans	<ul style="list-style-type: none"> • Government plans and protocols; local implementation arrangements in place

9. Implementation of the Conservation Action Plan

9.1 Considerations for implementation and need for review

This action plan presents a range of actions for implementation within the first two to three years of the 'project' to save the Great Bustard in Morocco. This is essential because no provisions are currently in place to safeguard this population, which has been identified by Morocco as a priority species for conservation. Although the Great Bustard itself is a protected species in the country, its only remaining sites do not benefit from any specific bustard conservation or management measures on the ground, and the limited existing site designations as SIBEs and partial inclusion within a Ramsar Site are not strong enough. The population is in decline and has reached a stage where urgent action is required if the species is to have any chance of escaping extinction as a breeding population.

Stakeholders at the Great Bustard workshop in September 2014 stipulated that no measures should be taken to either to introduce birds from another country (e.g. Spain) to Morocco or to rear bustards in captivity, unless the situation was critical. The situation has probably not reached that critical point yet (J.C. Alonso, *in litt.* 2015), as populations elsewhere have recovered from similar numbers as a direct result of intensive conservation measures. Thus, the action plan does not describe any actions related to ex-situ conservation measures. However, the situation is close to critical, and if censuses in the next few years indicate that the population continues to decline or that breeding males reach only about five birds, then the stakeholders may wish to review their earlier decision. In such a case, captive breeding of Moroccan birds would seem to be a non-viable option, due to the extremely low stock remaining and the proven difficulty of captive breeding. Thus, introduction of bustards from Spain (the closest birds genetically to Great Bustards in Morocco, and the largest stock of wild bustards worldwide) in some form or other may need to be considered.

Alonso *et al.* (2015) considered that, although measures reinforcing productivity are desirable, adult mortality represents currently the main threat in Morocco, and thus any human-induced adult mortality cause should be eliminated through an intensive and permanent surveillance of all existing breeding areas by full-time, specialized guards, together with agri-environmental measures directed to improve habitat quality and enable a successful breeding. Minimisation of power line collision mortality requires urgent attention, backed up by monitoring through collision transects. These considerations are matched well by the threat ranking and prioritisation of actions given in this plan. However, things can change, and given that the bustards are mainly limited to two breeding areas, the threat of agricultural intensification in these areas may become a higher priority.

For these and other reasons, it is advised to review the action plan every three years in light of results from population and project monitoring.

9.2 Practicalities

Implementation of this action plan requires a presence of conservation personnel within the main bustard strongholds. As the main areas are rather remote, it would make sense to establish a small project base within Araoua, for example at the village of Had Gharbia. Although Asilah is not too far away, it is not a practical project centre for *écogardes* or for most proposed activities. This may require purchase or rent of a suitable building in Araoua. Such a building could also serve (if appropriate) as an awareness centre (e.g. Maison d'Environnement). It would be desirable to also have a small project base in Tleta-Rissana, which could perhaps be negotiated on a local level and mainly serve as a meeting point for *écogardes* and project coordination staff.

The project also requires a full-time coordinator, ideally supported by an assistant. The ideal scenario would be a Project Coordinator tasked with managing the project and network of *écogardes*, and a research assistant, tasked with planning the censuses and other research activities. It may be necessary to source / provide accommodation for these staff, as it is unlikely they would be already resident in the area.

Implementation requires a network of people charged with surveillance responsibilities, here termed *écogardes*. The number of *écogardes* hired will depend to a certain extent on resources, but a minimum would be two in the Araoua area and two in Tleta-Rissana. The project team will also require equipment and the means to carry out their work, notably transport, research equipment, mobile phones and uniforms. Such equipment is standard in Moroccan protected areas.

A steering group or coordination committee is essential from year 1 to guide the implementation and take decisions.

10. Acknowledgements

This action plan has involved a number of people and organisations who have given time and resources towards ensuring its inception, development and publication. The IUCN Centre for Mediterranean Cooperation has coordinated the process, led by Violeta Barrios, with support of Catherine Numa, Sonsoles San Román and Antonio Troya. A key event was the stakeholder workshop held in Asilah in September 2014, which was facilitated by Chris Magin. All participants, including international experts and members of Moroccan agencies (listed in Appendix I) are sincerely thanked for their active input and constructive contributions. Nigel Collar (Chair of the Bustard SG), Juan Carlos Alonso and Carlos Palacín all provided critical advice and support during the development of this plan.

Tim Dodman (compiler) undertook a fact-finding mission in Morocco in March 2015, which complemented the workshop. He received excellent support in planning and executing the mission from Rachid El Khamlichi and Imad Cherkaoui (GREPOM). He also warmly thanks everyone he met and interviewed during the mission (listed in Appendix II). Imad Cherkaoui also supported the whole project along with others in the GREPOM network, notably Abdeljebbar Qninba, who was lead author of the document “La grande outarde (*Otis tarda*) au Maroc : État des connaissances sur l’espèce”, an excellent precursor to this action plan.

Another notable event in March 2015 was the Great Bustard census led by Juan Carlos Alonso and Carlos Palacín, of the Consejo Superior de Investigaciones Científicas, Madrid, Spain, who have played a leading role in Great Bustard research in Morocco. They and all census participants are thanked for their hard field work and efficient reporting.

The development of the plan would not have been possible without the active coordination and engagement of the Haux Commissariat aux Eaux et Forêts et de la Lutte Contre la Désertification. Clearly, this commission is dedicated to ensuring the Great Bustard does not decline further in Morocco, and will no doubt play a leading role in implementation of this action plan. In particular, Rachid Aboulouafae, Zouhair Amhaouch, Abdelaziz Hajaji, Said Mekkek, Hayat Mesbah and Mohamed Noaman have all contributed significantly.

The real guardians of the Great Bustard in Morocco are the local farmers and shepherds on whose land the bustards live. Despite the declining status of the bustard, some of the local communities within the Great Bustard areas are clearly proud to share their land with bustards and keep a close eye out for anything that constitutes a threat.

Finally, the IUCN Centre for Mediterranean Cooperation sincerely thanks the MAVA Foundation for providing funding for the development of the plan.



Great Bustards fighting (photo © Carlos Palacín)

11. Acronyms

ADM	Société Nationale des Autoroutes du Maroc
AESVT	Association des enseignants en sciences de la vie et de la terre de Tanger
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CSIC	Consejo Superior de Investigaciones Científicas (Museo Nacional de Ciencias Naturales, Madrid)
EIA	Environmental Impact Assessment
ENA	École Nationale d'Agriculture de Meknès
GREPOM	Groupe de Recherche pour la Protection des Oiseaux au Maroc
HCEFLCD	Haut Commissariat aux Eaux et Forêts et de la Lutte Contre la Désertification
IBA	Important Bird and Biodiversity Area
IUCN	International Union for Conservation of Nature
LGV	Ligne de Train à Grande Vitesse (High-speed Train Line)
LTO	Long-term Objective
MAPM	Ministère de l'Agriculture et de la Pêche maritime
METL	Ministère de l'Équipement, du Transport et de la Logistique
ONCF	Office National des Chemins de Fer (National Railways Office)
ONE	Office National de l'Électricité (National Electricity Office)
SEEPOM	Association d'Éducation Environnementale et de Protection des Oiseaux au Maroc
SIBE	Site d'Intérêt Biologique et Écologique (Site of Biological and Ecological Interest)
SG	Specialist Group
SSC	Species Survival Commission
TGV	Train à Grande Vitesse (High-speed Train)

12. Bibliography

- Alonso, J.C. (coord.). 2004. Viabilidad de la población de Avutardas de Marruecos. Bases científicas para su conservación. Unpublished report. AEI-CSIC, Madrid.
- Alonso, J.C., Palacín, C. and Onrubia, A. 2015. Status of the Great Bustard (*Otis tarda*) in Morocco: update 2015. Museo Nacional de Ciencias Naturales, Consejo Superior de Investigaciones Científicas (CSIC), España / Haut Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification, Royaume du Maroc.
- Alonso, J.C. et Palacín, C. 2010. The world status and population trends of the Great Bustard (*Otis tarda*): 2010 update. *Chinese Birds* 1: 141-147.
- Alonso, J.C., Martín, C.A., Alonso, J.A., Palacín, C., Magaña, M., Lieckfeldt, D. and Pitra, C. 2009a. Genetic diversity of the great bustard in Iberia and Morocco: risks from current population fragmentation. *Conservation Genetics* 10(2): 379-390.
- Alonso, J.C., Palacín, C., Alonso, J.A. and Martín, C.A. 2009b. Post-breeding migration in male great bustards: low tolerance of the heaviest Palearctic bird to summer heat. *Behavioral Ecology and Sociobiology* 63: 1705-1715.
- Alonso, J.C., Palacín, C., Martín, C.A., Mouati, N., Arhzaf, Z.L. and Azizi, D. 2005. The Great Bustard *Otis tarda* in Morocco: a re-evaluation of its status based on recent survey results. *Ardeola*, 52(1): 79-90.
- Alonso, J.C., Palacín, C. and Martín, C.A. 2003. Status and recent trends of the great bustard (*Otis tarda*) population in the Iberian peninsula. *Biol. Conserv.* 110: 185-195.
- Alonso, J.A., Martín, C.A., Alonso, J.C., Morales, M.B. and Lane, S.J. 2001. Seasonal movements of male great bustards (*Otis tarda*) in central Spain. *Journal of Field Ornithology* 72: 504-508.
- Alonso, J.C., Morales, M.B. and Alonso, J.A. 2000a. Partial migration, and lek and nesting area fidelity in female great bustards. *The Condor* 102: 127-136.
- Alonso, J.C., Lane, S.J., Dawson, R. and Idaghdour, Y. 2000b. Great bustards *Otis tarda* in Morocco: status in spring 1999 and evidence of a decline in recent decades. *Oryx* 34: 141-146.
- Alonso, J.C., Alonso, J.A. and Muñoz-Pulido, R. 1994. Mitigation of bird collisions with transmission lines through groundwire marking. *Biological Conservation* 67: 129-134.
- Arhzaf, Z.L. 2010. Contribution à l'étude des causes de régression de la Grande Outarde (*Otis tarda* L., 1758) au Maroc. Thèse de Doctorat, Université Mohammed V-Agdal, Faculté des Science, Rabat, 125 pp.
- Barrientos, R., Ponce, C., Palacín, C., Martín, C.A., Martín, B. and Alonso, J.C. 2012. Wire marking results in a small but significant reduction in avian mortality: a BACI designed study. *PLoS ONE* 7(3): e32569. doi:10.1371/journal.pone.0032569.
- Barrientos, R., Alonso, J.C., Ponce, C. and Palacín, C. 2011. Meta-Analysis of the effectiveness of marked wire in reducing avian collisions with power lines. *Conservation Biology* 25: 893-903.
- BirdLife International 2013. *Otis tarda*. The IUCN Red List of Threatened Species. Version 2015.2. www.iucnredlist.org. Downloaded on 17 August 2015.
- Dakki, M., El Agbani, M.A. and Qninba, A. (Eds). 2011. Zones humides du Maroc inscrites jusqu'en 2005 sur la Liste de la Convention de Ramsar. Trav. Inst. Sci., Rabat, Sér. Générale, 7.
- Faragó, S. 1986. Suggestion for keeping register book-like records of European Great Bustard (*Otis tarda* Linne 1758) populations. 5th ICBP Bustard Symposium. Szarvas, Hungary.
- Hellmich, J. and Idaghdour, Y. 2002. The great bustard *Otis tarda* population in Morocco in 1998-2001. *Bird Conservation International*, 12, 19-33.
- Horreo, J.L., Alonso, J.C., Palacín, C. and Milá, B. 2014. Genetic structure in Iberian and Moroccan populations of the globally threatened great bustard (*Otis tarda*): a microsatellite perspective. *Journal of Avian Biology* 45: 507-513.
- Kessler, A.E., Batbayar, N., Natsagdorj, T., Batsuur, D., and Smith, A.T. 2013. Satellite telemetry reveals long-distance migration in the Asian great bustard *Otis tarda dybowskii*. *Journal of Avian Biology*, 44: 001-010.
- Lane, S.J., Alonso, J.C. and Martín, C.A. 2001. Habitat preferences of great bustard *Otis tarda* flocks in the arable steppes of central Spain: are potentially suitable areas unoccupied? *Journal of Applied Ecology* 38: 193-203.
- LIFE Impacto Cero. 2014. Development and demonstration of an anti bird-strike tubular screen for High Speed Rail lines. LIFE+ 2012 Biodiversity project BIO/ES/000660. 2013-17.
- Martín, B., Martín, C.A., Palacín, C., Magaña, M., Alonso, J.A., and Alonso, J.C. 2004. Effect of collision with power lines on the viability of the Great Bustard metapopulation in Madrid province. Poster, International Symposium on Ecology and Conservation of Steppe-land Birds, Lleida.

- Morales, M.B., Alonso, J.C., Alonso, J.A. and Martin, E. 2000. Migration patterns in male great bustards. *The Auk* 117: 493-498.
- Nagy, S. 2009. International single species action plan for the Western Palearctic population of Great Bustard, *Otis tarda tarda*. BirdLife International, Cambridge.
- Palacín, C., Martín, B., Onrubia, A. and Alonso, J.C. 2016. Assessing the extinction risk of the great bustard *Otis tarda* in Africa. *Endang. Species Res.* 30: 73–82.
- Palacín, C., Alonso, J.C., Martín, C.A. and Alonso, J.A. 2012. The importance of traditional farmland areas for steppe birds: a case study with migrant Great Bustard *Otis tarda* females. *Ibis* 154: 85-95.
- Palacín, C., Alonso, J.C., Alonso, J.A., Martín, C.A. and Magaña, M. 2011. Cultural transmission and flexibility of partial migration patterns in a long-lived bird. *Journal of Avian Biology*, 42, 301-308.
- Palacín, C., Alonso, J.C., Alonso, J.A., Martín, C.A., Magaña, M. and Martín, B. 2009. Differential migration by sex in the great bustard. Possible consequences of an extreme sexual size dimorphism. *Ethology*, 115, 617-626.
- Palacín, C. and Alonso, J.C. 2008. An updated estimate of the world status and population trends of the Great Bustard *Otis tarda*. *Ardeola* 55: 13-25.
- Qninba, A. 2016. La grande outarde (*Otis tarda*) au Maroc : État des connaissances sur l'espèce. Report for IUCN Centre for Mediterranean Cooperation.
- Raab, R., Schütz, C., Spakovszky, P., Eike, J. and Schulze, C.H. 2012. Underground cabling and marking of power lines: conservation measures rapidly reduced mortality of West-Pannonian Great Bustards *Otis tarda*. *Bird Conservation International*, 22, 299-306.
- Streich, W.J., Litzbarski, H., Ludwig, B. and Ludwig, S. 2006. What triggers facultative winter migration of Great Bustard (*Otis tarda*) in Central Europe? *Eur. J. Wildlife Res.*, Vol. 52(1): 48-53.
- Thévenot, M., Vernon, R. and Bergier, P. 2003. *The Birds of Morocco*. British Ornithologists' Union, Checklist series no. 20, Tring, UK. 594 pp.
- Torres, A., Palacín, C., Seoane, J. and Alonso, J. C. 2011. Assessing the effects of a highway on a threatened species using Before-During-After and Before-During-After-Control-Impact designs. *Biological Conservation*, 144, 2223-2232.
- Watzke, H. 2007. Results from satellite telemetry of Great Bustards in the Saratov region of Russia. *Bustard Studies* 6: 83–98.

Appendix I: Overview of Stakeholder Workshop

Workshop Summary

The **Strategy for the conservation of the Great Bustard *Otis tarda* (Vulnerable) in Morocco Stakeholder Strategy Development Workshop** was held from 17-19 September 2014 in Asilah, Morocco. The workshop comprised presentations, working groups and a field visit. There were 27 participants: 20 from Morocco, 2 Great Bustard experts from Spain and 1 from Austria, 3 IUCN-Mediterranean office staff members, and the facilitator. The workshop aimed to develop a Vision, Goal, Objectives and Actions to form the core of a Species Action Plan or Strategy to conserve the Great Bustard population in Morocco.

Due to time constraints it was not possible to develop detailed actions during the workshop. Participants agreed however that ex-situ captive breeding using Moroccan birds or eggs as a source population should not be considered as an action. They also agreed that reinforcement of the population with birds from other countries should only be contemplated as a last resort if in-situ efforts failed to stabilise the population decline.

The workshop was organised by the IUCN Centre for Mediterranean Cooperation and the Haut Commissariat aux Eaux et Forêts et de la Lutte Contre la Désertification (HCEFLCD), with support from the Groupe de Recherche pour la Protection des Oiseaux au Maroc (GREPOM) and with financial support from the MAVA Foundation.

Workshop Participants



Workshop participants on the steps of the Hotel Asilah Marina Golf, Asilah, Morocco (Photo © IUCN-Med)

Name	Institution
ABOULOUAFAE Rachid	Direction Régionale HCEFLCD du Rif – Tétouan ; Service du Partenariat pour la Conservation et le Développement des Ressources Naturelles
ALONSO Juan Carlos	Museo Nacional de Ciencias Naturales, Madrid – Consejo Superior de Investigaciones Científicas (CSIC)
AZIZI Driss	Association d'Éducation Environnementale et de Protection des Oiseaux au Maroc (SEEPOM)
BARRIOS Violeta	Centre de Coopération pour la Méditerranée de l'UICN
BOUABBAD Abdelaziz	Direction Régionale du HCEFLCD du Rif – Tétouan Centre de la Conservation et du Développement des Ressources Forestières d'Assilah
BOUSFIZZA Med	GREPOM
BRITEL Abderraouf	Directeur Provincial – Tanger, HCEFLCD
CHAKER Younis	Direction Régionale du HCEFLCD du Rif – Tétouan Service de la Programmation, de la Valorisation et de l'Évaluation
CHAKRI Said	Association des Enseignants des Sciences de la Vie et de la Terre de Tanger (AESVT)
CHERKAOUI Imad	Directeur exécutif, GREPOM
EL AGBANI Mohammed Aziz	Institut Scientifique de Rabat/Vice-Président du GREPOM
EL IDRISSE ESSOUGRATI Abdelaziz	GREPOM
EL KHAMLIHI Rachid	GREPOM Tétouan
HADDANE Brahim	UICN, Conseiller pour Afrique
HIMMI Oumnia	Institut Scientifique de Rabat/Membre du GREPOM
MAGIN Chris	Royal Society for the Protection of Birds (RSPB)
MESBAH Hayat	Chef de Service de la Conservation de la Flore et de la Faune sauvage, HCEFLCD
NOAMAN Mohamed	Service de la Conservation de la Flore et de la Faune sauvage, HCEFLCD
NUMA Catherine	Centre de Coopération pour la Méditerranée de l'UICN
OUAFAE Azzat	Direction Régionale du HCEFLCD de Fès-Boulemane – Fès ; Centre Technique pour le Développement des Ressources Cynégétiques
PALACÍN Carlos	Museo Nacional de Ciencias Naturales, Madrid – Consejo Superior de Investigaciones Científicas (CSIC)
QNINBA Abdeljebbar	Institut Scientifique de Rabat/Membre du GREPOM
RAAB Rainer	Great Bustard Conservation Team/coordonateur pour l'Europe centrale
RADI Mohamed	École Normale Supérieure de Marrakech/Membre du GREPOM
SALMI MRABET Ahmed	Directeur du Groupe scolaire de Hjar N'hal
SIDI BEN SALAH Mustapha	Association des Enseignants des Sciences de la Vie et de la Terre de Tanger (AESVT)

Appendix II: Action Plan Development Mission, March 2015

Mission Overview

A mission was undertaken by Tim Dodman, compiler of the action plan, from 12-19 March 2015 in order to gauge a deeper understanding of the issues relevant for Great Bustard conservation, through site visits and interviews. Imad Cherkaoui (GREPOM) aided in organising the mission, which was undertaken mostly with Rachid El Khamlichi (GREPOM – Tétouan). The mission followed on from the 2015 Great Bustard census (Alonso *et al.* 2015).

Great Bustards were seen on three occasions – a flock of 11 birds in Araoua on 15th March, 5 parading males and 2 females at a lek in Araoua on 16th March and one female in an agricultural field in Tleta Rissana, also on 16th March.

Discussions and interviews yielded significant information about Great Bustard threats and conservation issues, with many useful ideas and considerations.

The Great Bustards in Morocco inhabit a very special ecosystem, albeit modified by man, where still some traditional agricultural and pastoral practices are followed. However, it was clear that the pressures they face are very real, and it may be hard to prevent the future agricultural development of the remaining areas where bustards survive.

Mission Itinerary

The mission lasted approximately one week, and the itinerary is summarised below.

Date	Itinerary	Activities
Thursday 12 th March	Arrive Rabat-Salé Airport Meetings in Salé and Rabat	Discussions at GREPOM office (Imad and Adel) Discussion at HCEFLCD office (Zouhair)
Friday 13 th March	Visit Sidi Bou Ghaba Meeting Rabat	Visit the Sidi Bou Ghaba Reserve Discussion with Arhzaf (SEEPOM)
Saturday 14 th March	Meeting, Rabat Travel Rabat to Asilah (car) Visit Tahaddart / Araoua	Discussion with Qninba (Institute Scientifique de Rabat) Meet Rachid El Khamlichi (GREPOM) Visit Great Bustard areas northeast of Asilah
Sunday 15 th March	Visit Great Bustard areas around Araoua and Had Gharbia village Pass through Kanouat Discussion south of Tangier	Visit bustard areas; look for bustards Brief discussions with local people See Kanouat area and LGV route Discussion with Abdelaziz (HCEFLCD-Asilah)
Monday 16 th March	Visit Great Bustard areas around Araoua and Tleta Rissana	Visit bustard areas; local discussions
Tuesday 17 th March	Visit Tendafel Go to Rissana / Sidi el Yamani junction Drive to Tétouan Go to Tangier	Visit Tendafel, south of Asilah Discussion with Kébir Discussion at HCEFLCD Tétouan office (Rachid) Discussion with Aziz (GREPOM)
Wednesday 18 th March	Travel to Rabat via Loukkos Marshes and Merja Zerga	Discussion with Abdelilah Maknass; gain insight into ecotourism operations at Merja Zerga
Thursday 19 th March	Leave Rabat-Salé airport	

Persons Interviewed during the Mission

Interviews / discussions were held with about 15 people during the mission, including the 11 below who are involved in nature conservation, research and/or management. In addition, discussions were held with a few villagers, farmers and shepherds within the Great Bustard's range.

Name	Institution
ABDELILAH Maknass	Association Hanjza Hamra pour l'écotourisme et la protection de la nature
ABOULOUAFAE Rachid	Direction Régionale HCEFLCD du Rif – Tétouan ; Service du Partenariat pour la Conservation et le Développement des Ressources Naturelles
AMHAOUCH Zouhair	Division des Parcs et Réserves Naturelles, HCEFLCD
ARHZAF Zine Laabidin	Président, SEEPOM
BOUABBAD Abdelaziz	Direction Régionale du HCEFLCD du Rif – Tétouan Centre de la Conservation et du Développement des Ressources Forestières d'Assilah
BOUAJAJA Adel	Chargé de conservation, GREPOM
CHERKAOUI Imad	Directeur exécutif, GREPOM
EL AGBANI Mohammed Aziz	Institut Scientifique de Rabat/Vice-Président du GREPOM
EL KHAMLIHI Rachid	GREPOM Tétouan
KÉBIR Ksassoua	Direction Régionale du HCEFLCD du Rif – Tétouan Centre de la Conservation et du Développement des Ressources Forestières de Krimda
QNINBA Abdeljebbar	Institut Scientifique de Rabat/Membre du GREPOM



Shepherd with sheep, Tleta Rissana (photo © Tim Dodman)



**INTERNATIONAL UNION
FOR CONSERVATION OF NATURE**

IUCN Centre for Mediterranean Cooperation
C / Marie Curie 22
29590 Campanillas
Malaga, Spain
Tel. : +34 952028430
Fax : +34 952028145
uicnmed@iucn.org

www.iucn.org/publications
www.iucn.org/mediterranean



Core support for the IUCN Centre for Mediterranean Cooperation is provided by

