# HANDBOOK ON OIL IMPACT ASSESSMENT

## 3.0 PREPAREDNESS

### Introduction

Not all European countries are equally prepared for oiled wildlife incidents. Some countries have developed an integrated oiled wildlife response plan, others are in a process to develop such a plan, but many countries do not have any pre-spill arrangement in place for oiled wildlife. Countries that have an oil spill response plan in place should be able to provide a management structure and strategy guidelines on how to deal with complicated emergencies. Unfortunately most plans are different from each other and there are substantial differences between countries in the way responsibilities are divided between ministries or between national, regional, and communal/local authorities.

Each country has a duty of care and a legal obligation to look after (marine) waters under their jurisdiction and to minimise the effects of oil pollution in these areas. To be able to respond properly to an oil spill, a country needs detailed information about spatial and temporal patterns in the sensitivity to oil pollution of the affected sea areas. Scientifically developed indices of area sensitivity are based on a combination of best available data on species specific oil vulnerability indices (OVIs), on seabird distribution patterns at sea, on breeding seabird populations, and on migratory pathways and timing. High quality information on area sensitivity is essential make sound decisions on the priorities with regard to oil clean-up operations and area protection.

A wildlife response should ideally be set up as part of the general oil spill response plan. Experience from past incidents demonstrates that the best results are achieved through pre-spill planning. Elsewhere, the logistics and rationale of a full-blown oil spill response will be discussed. With respect to pre-planning and preparedness regarding possible wildlife casualties during an oil spill, three main issues are considered within the context of this handbook:

(1) Which are the most sensitive sea areas under my jurisdiction (→ know your area)

(2) Who are the trained experts that should be involved in the response (→ know your experts)

(3) What facilities / material can be made available (→ prepare or select facilities beforehand)

### 3.1 Planning ahead, foreseeing risks

**Know your seabirds** Seabird species differ in their vulnerability to oil spills. Some species are more aerial than others, and shearwaters, storm-petrels, terns and gulls are examples of aerial families that at best plunge in the water to catch their prey. Other species spend most time on the water surface, sleep and rest exclusively at sea, and form large aggregations of individuals in rich feeding areas. Some species roost on land, while others are fully pelagic. In general terms, the truly pelagic and least aerial species are the most vulnerable to oil pollution. Many of those swimming species dive to feed and some, like guillemots descend during foraging to spectacular depths (150m deep and more; Piatt & Nettleship 1985). The pressure exerted on the plumage during a dive is considerable, certainly during dives deeper that 20 or 30m, and thus the plumage needs to be in perfect condition to avoid loss of insulation.

So the scale of vulnerability of seabirds depends not only on numbers present but also on the behavioural and other characteristics of the species involved. Several studies have examined ways of assessing these characteristics and the species-specific sensitivity to oil pollution (Oil Vulnerability Indices, OVI; reviewed by Camphuysen 2007). In most cases, marine species were graded on the basis of various factors that affect their survival. Each of these factors was given a score representing respectively no, low, medium or high relevance of that factor in increasing sensitivity to oil pollution. Several authors noted that scores for several species would alter if sub-species were used instead of species, indicating the importance of choice of taxonomic level.

Different techniques to calculate OVIs led to different outcomes, but Anon. (2002) compared several indices and found significant relationships between OVIs calculated for the same species in different parts of the world. Significant correlations were found between OVIs scored for species common to King & Sanger (1979) and Camphuysen (1989) ($R_S = 0.572$, $P = 0.001$, $n = 32$), between the proportion of beached birds found oiled on Netherlands beaches and OVI scores of Camphuysen (1989) ($R_S = 0.685$, $P = 0.001$, $n = 21$), between OVIs of Camphuysen (1989) and of Williams *et al.* (1995) for the North Sea ($R_S = 0.454$, p = 0.004, n = 37), and between the oil rate of beached birds found in The Netherlands and OVI scores of Williams *et al.* (1995) ($R_S = 0.446$, p = 0.015, n = 29).

Within western Europe, following Camphuysen (1989), the seabird families most sensitive to oil pollution are auks (mean OVI 77.2), divers (66.3), cormorants and shags (66.0), gannets and boobies (65.0), and sea ducks (64.2) (Table 3.1). Moderately sensitive seabirds are petrels and shearwaters (59.2), diving ducks (58.0), grebes (53.3) and storm-petrels (50.3). Species of lower sensitivity are found in the terns (47.9), gulls (45.1), skuas (42.6), and phalaropes (38.0). There are notable exceptions, however, such as the Black-legged Kittiwake, a highly sensitive gull (OVI 66). Phalaropes rank very low, but one should not try to imagine an oil slick in their main wintering areas off the West African coast. Note that phalaropes ranked significantly higher in the King & Sanger (1979) analysis for the North Pacific, an area where phalaropes are common.

Table 3.1 Mean Oil vulnerability index scores of Camphuysen (1989) per family and range for species scored for the North Sea.

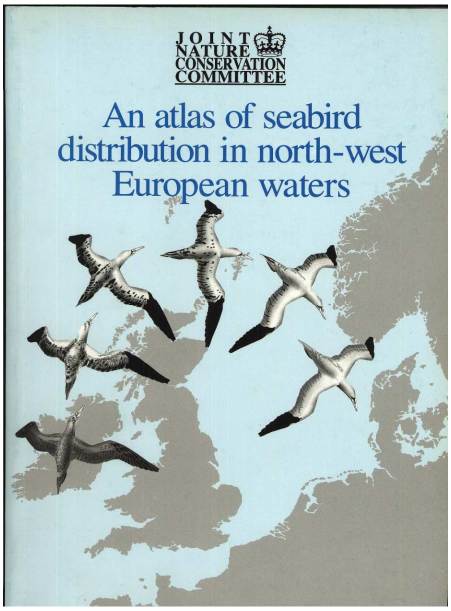
| Family | Mean OVI | Min | | Max |
|---|---|---|---|---|
| auks | 77.2 | 65 | - | 86 |
| divers | 66.3 | 65 | - | 68 |
| cormorants | 66.0 | 59 | - | 73 |
| gannets | 65.0 | 65 | - | 65 |
| sea ducks | 64.2 | 45 | - | 75 |
| petrels and shearwaters | 59.2 | 47 | - | 65 |
| diving ducks | 58.0 | 58 | - | 58 |
| grebes | 53.3 | 46 | - | 58 |
| storm-petrels | 50.3 | 49 | - | 54 |
| terns | 47.9 | 46 | - | 51 |
| gulls | 45.1 | 36 | - | 66 |
| skuas | 42.6 | 36 | - | 58 |
| phalaropes | 38.0 | 37 | - | 39 |

With few exceptions, these species breed at high latitudes in the temperate, subarctic and arctic zones, sometimes deep inland (divers and seaduck), and winter in the Baltic, the North Sea and along the Atlantic seaboard between the Norwegian Sea and NW Africa. In winter, much greater numbers and more species are at risk than in summer, and the distribution of the more vulnerable taxa extends further to the south. It is therefore no surprise that most of the damage done by chronic oil pollution was in winter and that most mass-mortality events were recorded in the areas indicated.

For as far as species-specific oil vulnerability indices have been calculated by Camphuysen (1989) and Williams *et al.* (1995), the OVIs are included in Technical Document {European Seabirds} associated with this chapter. Note that OVI's are not just species specific, but also area specific! Monthly exposure, area usage, behaviour, and habitat characteristics differ and must be considered in a thoughtful way, to obtain a sensible index. Phalaropes, for example, that rank rather low for the North Sea (Table 3.1) would probably be considered highly sensitive in their main wintering areas off the West African coast (Macaronesia). It is quite clear that much work has to be done to finalise this task, and we would like to invite scientists to participate in this work in the near future. Area specific OVI's will need be assessed for all major sea areas within Europe (Table 3.2) in the near future.

**Know your area** There are spatial and temporal patterns in the sensitivity of sea areas for oil pollution, for as far as marine wildlife such as seabirds and marine mammals is concerned. Information on the sensitivity of the various sea areas under the jurisdiction of a responder is essential for a proper oil spill response to take place and there are far too many cases in which a technical response was started, without a proper evaluation of area sensitivity. Prioritising clean-up operations in the most sensitive areas can greatly reduce the number of casualties during a spill.

All of the above purposes require not only species specific OVIs, but also information on the relative occurrence and timing of the seabird species within areas; in other words temporal and spatial information that ideally is presented in the form of maps. King & Sanger (1979) included temporal information as a seasonal (quarterly) exposure factor. In recent work in NW European waters, seabird at sea density information has been collected at sea during standardised surveys from ships and aircraft and information on the relative occurrence of the species within areas can be calculated on a seasonal, or even monthly basis.



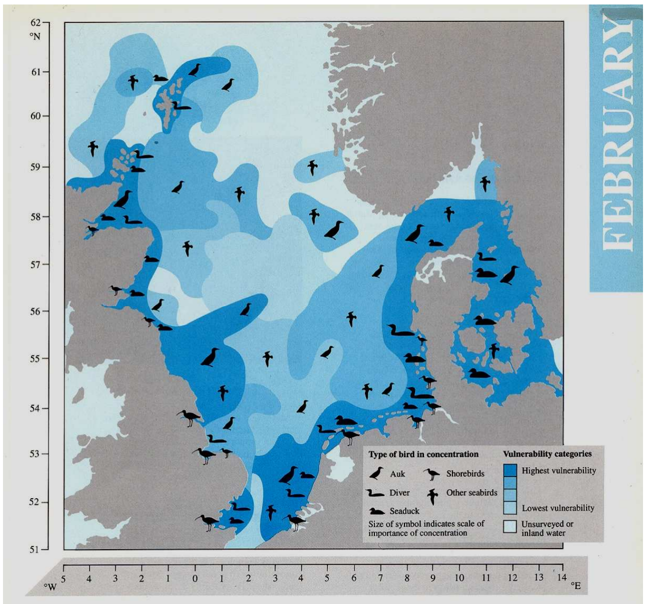




Figure 3.1. Example of a seabird distribution atlas (Stone *et al.* 1995) and a generalised map highlighting sensitive areas with regard to oil pollution within the North Sea after basic distribution data were re-evaluated (from Carter *et al.* 1993).

If seabird species with a high OVI score occur in high densities in a particular sea area, that area would naturally classify as a sensitive area with respect to oil pollution and immediate conservation actions would be required in case of a spill. Much less immediate concern would be necessary in areas holding few and only low scoring species. Distribution atlases are just the first step, while the next step should be the transformation of species specific seabird distribution patterns into generalised oil vulnerability maps. Unfortunately, that step has thus far only seldom been undertaken (examples are Carter *et al.* 1993; Webb *et al.* 1995). Atlases of area vulnerability to oil spills are obviously a much more precise and therefore much needed tool for planning and emergency response.

Data on area specific differences in the sensitivity to oil pollution on the basis of updated seabird information should be collected *before* a possible spill (Chapter 3.0 Preparedness), but must be promptly checked and updated *during* the spill (Chapter 4.2 Biological advice during Spill Response). Migratory movements between areas in winter, spring, summer, and autumn lead to shifts in the seabird community within areas and, hence, in the occurrence of species with high OVI scores. Decision makers in the oil spill response should be aware of the seasonality and take these patterns into account. They should realise that the situation regarding area sensitivity might chance dramatically *during* the event. An essential part of the biological advice they would need is an elaboration of a (worst) case scenario, in which shifts in vulnerable wildlife abundance are forecasted on the basis of local knowledge of migration routes, timing of migration, and stop-over sites.

**Current knowledge of sensitive areas within Europe** Unfortunately, while generalised oil vulnerability atlases have been produced for some areas, these are missing or inadequate for other regions. It is these vulnerability maps that are the most useful tools for technicians responding to a spill, because biological know-how is not needed to understand these maps. While reviewing Europe's sea areas in these respects (Camphuysen 2007), it became clear that

(1) there is substantial recent knowledge on seabird distribution and migration patterns, but with large gaps,

(2) only few areas have been evaluated in terms of their sensitivity to oil pollution on the basis of marine wildlife and species-specific OVIs,

(3) some of the worst recent spills in terms of casualties (i.e. *Erika, Prestige*) occurred in sea areas for which both data sets are lacking or at best incomplete, and

(4) in well covered areas where vulnerability atlases have been produced, the data are currently ageing (risk of outdated information); new surveys may be required as updates

Fifteen major sea areas within Europe have been identified and evaluated in terms of present knowledge (Table 3.2). A review of these sea areas, including an indication of the occurrence of the most sensitive bird families, the availability of high-quality seabirds at sea data, and whether or not a recent evaluation of the sensitivity to oil pollution has been undertaken or would be possible is summarised below (Table 3.3). Technical documents associated with this chapter (15 in all, for all sea areas listed in Table 3.2) are meant to provide further details.

As a next step to improve preparedness, we would strongly recommend a thorough (re-) evaluation of all European seas in terms of their sensitivity to oiling. Systematic offshore surveys studying seabird distribution patterns should be promoted in all data deficient or partly covered sea areas (Table 3.3), while the analysis of available data should be stimulated to assess patterns in area sensitivity as described earlier.

Table 3.2 Major sea areas in Europe and countries potentially involved during oil spill responses in each of these.

| # | Sea area | Countries involved in spill response |
|---|---|---|
| 1 | Greenland Sea and Icelandic waters | Denmark (Greenland), Iceland |
| 2 | Svalbard | Norway |
| 3 | Barents Sea | Norway, Russia |
| 4 | Norwegian Sea | Norway, Denmark (Faeroese waters), United Kingdom (Shetlands) |
| 5 | Faeroese waters | Denmark (Faeroe Islands) |
| 6 | North Sea | Denmark, Germany, The Netherlands, Belgium, United Kingdom, Norway |
| 7 | Baltic Sea | Denmark, Sweden, Finland, Russia, Estonia, Latvia, Lithuania, Poland, Germany |
| 8 | West of Britain, Ireland and Irish Sea | Ireland, United Kingdom |
| 9 | Channel and Celtic Sea | Ireland, United Kingdom, France |
| 10 | Bay of Biscay | Spain, France |
| 11 | Portuguese and Spanish Atlantic coasts | Portugal, Spain |
| 12 | The Azores, Canaries, Madeira, Cape Verde Islands (Macaronesia) | Portugal (Azores, Madeira), Spain (Canaries), Morocco, Mauritania, Cape Verde Islands |
| 13 | Western Mediterranean | United Kingdom (Gibraltar), Spain, France, Italy, Libya, Tunisia, Algeria, Morocco |
| 14 | Eastern Mediterranean | Libya, Egypt, Israel, Palestine, Lebanon, Syria, Cyprus, Turkey, Greece, Albania, Serbia, Croatia, Slovenia, Italy, Malta |
| 15 | Black Sea | Turkey, Bulgaria, Georgia, Romania, Russia, Ukraine |

Table 3.3 Overview of current high-quality knowledge of seabird at sea distribution in Europe and attempts to evaluate species-specific OVIs and area vulnerability to oil pollution.

| Area | Seabirds at sea data | OVI and area sensitivity | Data availability |
|---|---|---|---|
| Greenland/Iceland | anecdotal data, local surveys | not analysed | data deficient |
| Svalbard | surveys in southern part | not analysed | partly covered |
| Barents Sea | summer surveys, some spring | not analysed | partly covered |
| Norwegian Sea | mainly nearshore surveys | not analysed | partly covered |
| Faeroese waters | extensive year-round surveys | vulnerability atlas | well covered, atlas |
| North Sea | extensive year-round surveys | vulnerability atlas | well covered, atlas |
| Baltic | extensive year-round surveys | not analysed | well covered, atlas |
| West of Britain, Irish Sea, Ireland | extensive year-round surveys | vulnerability atlas | well covered, atlas |
| Channel, Celtic Sea | extensive year-round surveys UK | vulnerability atlas UK | partly covered |
| Bay of Biscay | fragmented survey data | not analysed | data deficient |
| Atlantic Portugal and Spain | new studies just commenced | not analysed | data deficient |
| Macaronesia | new studies just commenced | not analysed | data deficient |
| West Mediterranean | new studies just commenced | not analysed | data deficient |
| East Mediterranean | not known | not analysed | data deficient |
| Black Sea | not known | not analysed | data deficient |

**Know your experts** For all sea areas, whether they have been properly studied or are data deficient, address lists should be compiled, to provide immediate access to the experts, institutes or (ornithological) organisations that could provide high quality biological advice *during* a spill. These experts should be able to demonstrate their expertise in this field and they should be directly involved in studies of seabird distribution patterns, migration studies, or wildfowl censuses on a routine basis.

For non-ornithologists or non-biologists, it is quite unclear whom to consider a specialist in oil-spill response. The type of expertise required for an area assessment and for an update of area sensitivity is highly specific. During oil spills, numerous NGOs and ornithological organisations beat the drums, while the most essential people are often unavailable, or difficult to trace down. In each country, the orga nisations or people needed for an area assessment will be different, but as a general guideline: organisations/institutions/persons involved in systematic seabirds at sea surveys, winter waterfowl censuses, systematic counts of coastal (sea-)bird migration, and monitoring programmes of breeding populations will have to be called in. In the Technical Documents associated with this chapter, we will try in guide towards the appropriate organisations for as far as these are known to us. As with the Technical Documents associated with Chapter 4, these texts and lists will be constantly updated. Note, however, that it will be impossible to provide complete and exhaustive address lists and one important step in pre-spill planning and preparedness for each and every country potentially involved in a future spill will be to try and list the experts and expertise beforehand.

## 3.2 Lessons learnt from previous spills

**Identify responders beforehand** Previous spills have shown that numerous people respond to the breaking news that an oil spill has occurred. Responders include the responsible authorities, insurers, experts, NGOs, news media and the general public (as spectators or as volunteers). It is a considerable challenge to steer all those responders in an efficient manner from the onset of the spill. Realising beforehand that such groups are likely to respond is helpful and a plan should be made outlining the responsibilities and the level of involvement for each of them.

**Who are the true experts?** With respect to oiled wildlife, despite a long history of oil spills within Europe, few responders are truly experienced. NGOs may present themselves as experts without being able to demonstrate practical involvement in previous spills. It is important to discuss expertise, train people where needed, and list the genuine and wanted experts/expertise as part of a preparation for a spill. The expertise required varies from the exceptional ornithological skills to identify a badly oiled or rotten bird corpse to a demonstrated experience in assessing patterns in area sensitivity to oil pollution based on survey data and wildfowl counts.

Figure 3.2. On 16 March 1978, the oil tanker Amoco Cadiz, transporting 227,000 tonnes of crude oil, suffered a failure of her steering mechanism, and ran aground on Portsall Rocks, on the Breton coast. The entire cargo spilled out as the breakers split the vessel in two, progressively polluting 360 km of shoreline from Brest to Saint Brieuc. This was the largest oil spill caused by a tanker grounding ever registered in the world. The consequences of this accident were significant, and it caused the French Government to revise its oil response plan (the Polmar Plan), to acquire equipment stocks, and to impose traffic lanes in the Channel. The photo shows the wreck of the Amoco Cadiz while being bombed by a helicopter to release the remaining oil from its holds. © CJ Camphuysen

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**Volunteer motivation** Some spills are short-lived and the area is readily cleaned, other oil incidents may take many months before the leakage and associated clean-up operations have stopped. While responders are highly motivated during the onset of a spill, triggered by the news media, it is important to keep up the work for as long as needed. Goodwill is easily spoiled; volunteers should not be overloaded with work.

**Tiered response** Small incidents do not need an extensive mobilisation of responders and volunteers whereas large complicated incidents probably do. A tiered response system provides guidance as to match the size of an incident with the number and qualification of responders that is probably required. The most commonly used system of tiered response recognises three tiers.

**Mechanisms for financial compensation** In the past it was often not clear to wildlife responders who in the end would pay for their expenses. After having done their mostly voluntary work, many organisations and individuals in the end failed to find a party that was willing to reimburse the expenses they had made. In many cases the claims to the ship's insurers were refused for unclear reasons. Nowadays, wildlife response activities, including those for impact assessment, are better recognised by the existing international mechanisms for financial compensation. However, these mechanisms do not always apply in any case of oil pollution. Well developed systems such as the so called Civil Liability Convention and International Oil Pollution Compensation Fund Convention will apply in the case of a spill from an oil tanker in the waters of a Coastal State that has ratified these conventions. For so called bunker spills (oil spills from a non-tanker) a mechanism for compensation has been developed but is not yet in force, pending the ratification in a number of Coastal States. The way in which the existing international compensation mechanisms systems work in wildlife incidents is well explained at http://www.oiledwildlife.eu/drupal-4.7.3/?q=node/7. It should be considered a matter of good practice that wildlife responders (including scientist who aim to carry out an impact assessment) are aware of these systems and seek information in the very early days of their activities in the aftermath of an oil spill through organisations like ITOPF (www.itopf.com) or Sea Alarm (www.sea-alarm.org).

## 3.3 Planning for an oil spill response (summary)

An agreed pre-spill oiled wildlife response plan is the best guarantee for a responsible, cost-efficient approach to an oil spill which involves wildlife. If a pre-spill planning is in place that outlines response coordination, capabilities, and procedures, an oiled wildlife response has the best probability of success. It is imperative that wildlife response plans should be fully integrated into the wider oil spill response plan.

The planning of an effective oiled wildlife response needs serious attention and will require the inputs and cooperation of many stakeholders including administrators, oiled wildlife response experts, oil spill response experts, competent authorities and others. Some guidelines for the planning process and critical issues to be addressed are described at http://www.oiledwildlife.eu/drupal-4.7.3/?q=node/4. Below, a number of issues that specially apply to impact assessment are emphasised..

**General issues** As a matter of basic pre-spill preparedness, key players in the field of impact assessment (authorities, scientists, volunteer coordinators) should be identified and sit together in order to define objectives, methodologies and responsibilities for impact assessment activities. It is recommended that baseline data on year-round seabird occurrence and concentrations of pollution sensitive species are collected and elaborated into seasonal sensitivity maps. The objectives and methodologies should be identified and agreed. Experts who are able to provide high quality biological advice should be identified and included into the telephone list of the existing oil spill response plan. Guidelines for the integration of search and collection activities into the beach monitoring and cleanup activities should be drafted.

**Legal responsibilities, licenses and liabilities** Legal responsibilities, the need for particular licenses (handling protected wildlife), and liability issues should be identified and agreed as good as possible. If licenses for animal (including corpses) handling need to be issued, it is important that pre-spill arrangements are in place so that search and collection can commence immediately after the first stranding of wildlife without having to wait for formalities that may take days or weeks under normal circumstances.

**Logistics and coordination** Pre-spill arrangements should include names and contact details of activity coordinators (who are well integrated into the overall oil spill response management system) and institutes and/or volunteer networks that have agreed to carry out hands-on work in the fields of search and collection and necropsies. Logistic planning (mobilisation of staff and volunteers, vehicles, facilities, equipment) should be ready and stocks of equipment (incl. personal protection equipment) must be available for immediate mobilisation.

**Training** A response plan needs to be trained regularly in order to gain importance. Training may include staff training and mobilisation exercises.

**International assistance**. In case national capacity is insufficient or its mobilisation is delayed, international assistance can be called on. Sea Alarm (Brussels; see contact details below) provides services in identifying and mobilising tailor made assistance of internationally operating wildlife responders.

**Finances** An oiled wildlife response is impossible without financial resources. These resources are best provided by the authorities. In the planning process, financial issues should be well discussed. Authorities may create an emergency fund or there may be an agreement that all involved parties pay their own expenses, pending the submission of a unified claim. In the design of the response activities, a successful claim should be anticipated. This can be done by developing a response plan that includes all elements that are recommended by leading international guidelines such as the Claims Manual of the IOPC Fund or the IPIECA Guide to Oiled Wildlife Response Planning.

**Health and safety** Working in a polluted environment is potentially hazardous for those involved, working along a shore in rough weather is potentially dangerous. Adequate measures should be taken (inc. training) to avoid health problems or loss of human lives during and after a response.

**Waste management, cleaning up** In the wildlife response activities (including impact assessment) it should be avoided to create unnecessary secondary pollution. The production of oiled waste should be minimised at all parts of the response. A waste management plan is best designed in accordance to national laws and regulations.

## Technical documents

European contacts.DOC List of useful contacts and expertise within Europe

European seabirds.DOC List of European seabirds and (current) OVI evaluation

Technical documents for chapter 4.2 (Descriptions of current knowledge in 15 defined sea areas)

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**Contact address:** [1]C.J. Camphuysen, Royal Netherlands Institute for Sea Research, P.O. Box 59, 1790 AB Den Burg, Texel, The Netherlands, camphuys@nioz.nl; [2]H. Nijkamp, Sea Alarm Foundation, Rue du Cyprès 7 – B10, 10000 Brussels, Belgium

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