# Impact of global warming on biodiversity in Egypt


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# PART 1:

# Introduction to Biodiversity

# &

# Importance of biodiversity

# What is Biodiversity?

**Biodiversity:** The variety of life on earth.

The United Nations Convention on Biological Diversity (CBD) defines biological diversity as the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part.

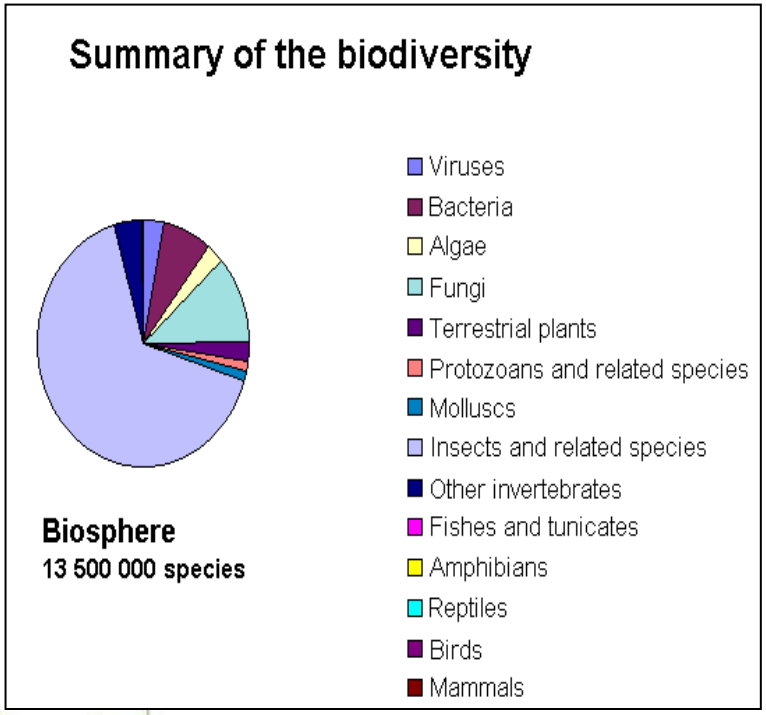
**Levels of biodiversity:**

1. Genetic diversity (within species)
2. Species diversity (between species)
3. Ecosystems diversity

# Species diversity

A recent estimate suggests that the eukaryote species for which science has named about 1.5 million species, account for less than 10 percent of the total number of eukaryote species present on the planet (13.5 million species, by one estimate).

The unique characteristics of each species make it potentially valuable to humans or other species on which humans depend. Understanding these characteristics is the value of finding and naming species.



# Why Biodiversity is important ?

**A healthy biodiversity offers many ecosystem services**

**Ecosystem services** are defined as the benefits that people obtain from the natural environment.

## Categories of ecosystem services:

### 1. Provision services:

About 90% of today's food crop's were originated from wild tropical plants

Wild plants supply rubber, oils, dyes, fiber, paper, lumber, and many other useful products.

At least 40% of all medicine (worth $ 100 billion per year) depend on the genetic resources of wild plants.

Over 70% of the world's food comes from only nine crops.

# Why Biodiversity is important ?

2. **Regulating services: including natural processes as water purification, biological control mechanisms, Pollution breakdown, carbon sequestration, and pollination of crops.**

3. **Cultural services: providing a source of artistic, spiritual, religious, ecotourism and recreational or scientific enrichment.**

4. **Supporting services: such as Contribution to climate stability, Soil formation and nutrients cycling.**

# Agriculture Biodiversity

Crop diversity is a requirement for food security, and it is being lost. The loss of wild relatives to crops also threatens the ability to create new varieties.

**How many species are required to provide you with a meal such as hamburger sandwich?**

**Beef** : cattle, roughage, grains (8+)

**Bun:** wheat, sugar, yeast , milk (4+)

**Ketchup:** tomato, species (5+)

**Mayo & mustard:** (4+/3+)

**Pickle:** cucumber, dill, garlic (3+)

**Lettuce & onion:** (1/1)

**Total : 29+ species**

# The Importance of Biodiversity to Human Life

**Ecosystems provide ecosystem services that support human agriculture: pollination, nutrient cycling, pest control, and soil development and maintenance. Loss of biodiversity threatens these ecosystem services and risks making food production more expensive or impossible**

# PART 2:

## Threats to Biodiversity

# Threats to Biodiversity

The core threat to biodiversity and human welfare, is the combination of human population growth and resource exploitation.

The three greatest proximate threats to biodiversity are;

- Habitat loss
- Overharvesting
- Introduction of exotic species.

The first two of these are a direct result of human population growth and resource use. The third results from increased mobility and trade.

# Threats to Biodiversity

## Exotic species

- Exotic species are species that have been intentionally or unintentionally introduced by humans into an ecosystem in which they did not evolve.

- These exotic species often undergo dramatic population increases in their new habitat and reset the ecological conditions in the new environment, threatening the species that exist there. For this reason, exotic species are also called **invasive species.**

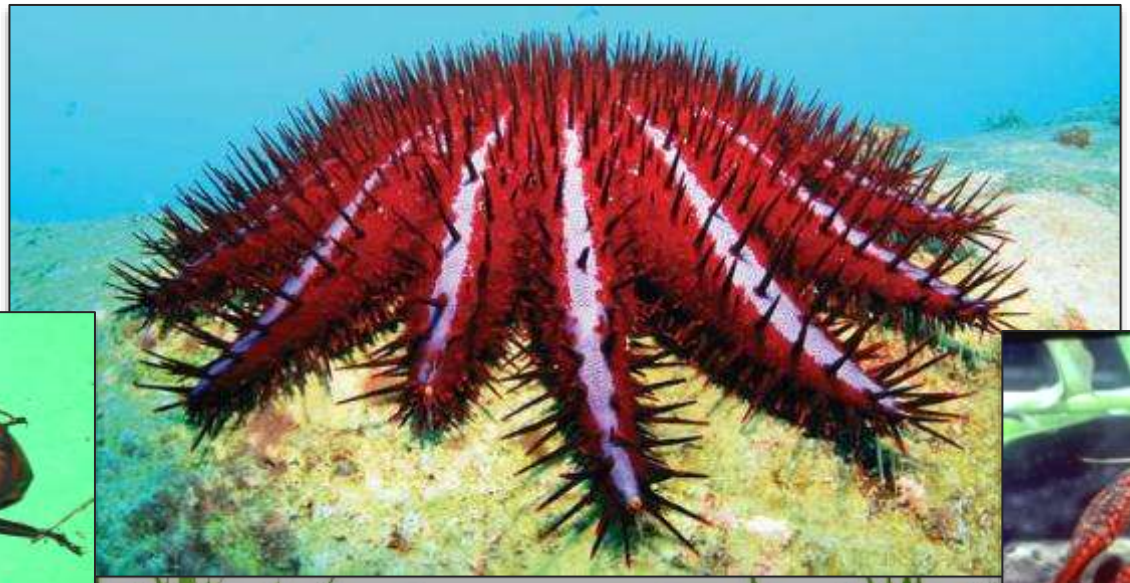
# INVASIVE ALIEN SPECIES IN EGYPT

Egypt has gained about 3% invasive plant species of the total Egyptian flora (ca 2088 species). They are represented by 84 species.

For example: Water hyacinth (*Eichhornia crassipes*) ,Water lettuce (*Pistia stratiotes*) ,and Mesquite tree (*Prosopis juliflora*). (Khedretal.2002)

# Threats to Biodiversity

- Many animal invasive species have been introduced to Egypt, including fishes, birds, insects, molluscs, crustaceans and others.
- For example: The cray fish (*Procambarus Clarkii*), western mosquito fish (*Gambusia affinis*), crown of thorn star fish (*Acanthaster planci*), Mediterranean fruitfly (*Ceratitis capitata*), and red palm weevil (*Rhynchophorus ferrugineus*). (NCS,2006)



# Threats to Biodiversity

- **Bush meat** is the generic term used for wild animals killed for food.
- Hunting is practiced throughout the world, but hunting practices, particularly in equatorial Africa and parts of Asia, are believed to threaten several species with extinction.

# Threats to Biodiversity

## Climate change

- Climate change, and specifically the anthropogenic (caused by humans) warming trend, is recognized as a major extinction threat, particularly when combined with other threats such as habitat loss.
- The burning of fossil fuels in recent history has caused a dramatic increase in the levels of carbon dioxide in the Earth's atmosphere, which have now reached levels never before seen on Earth.
- Climate change will alter regional climates, including rainfall and snowfall patterns, making habitats less hospitable to the species living in them.

# Threats to Biodiversity

- The warming trend will shift colder climates toward the north and south poles, forcing species to move with their adapted climate norms while facing habitat gaps along the way. Global warming affects the climatic envelope of species, the range of temperatures, rainfall and other climate-related parameters in which a species currently exists. As the climate warms, the geographic location of climatic envelopes will shift significantly, possibly even to the extent that species can no longer survive in their current locations.
- Such species will need to follow their climatic envelopes by migrating to cooler and moister environments, usually uphill or towards the poles.
- The shifting ranges will impose new competitive regimes on species as they find themselves in contact with other species not present in their historic range.

# Threats to Biodiversity

- Range shifts are already being observed: for example, some European bird species ranges have moved 91 km northward.

- Range shifts have also been observed in plants, butterflies, other insects, freshwater fishes, reptiles, and mammals.

- The high temperatures will pay organisms to escape to the high mountain areas and this will lead to the isolation of those objects on top of those mountains in the form of scattered groups living in semi-isolated islands .

- Global warming will raise ocean levels due to melt water from glaciers and the greater volume of warmer water. Shorelines will be inundated, reducing island size, which will have an effect on some species, and a number of islands will disappear entirely.

# Threats to Biodiversity

- Some fragile ecosystems will be affected in particular by climate change , such as coral reefs, mangroves , and ecosystems of the high mountains .

# Sinai Baton Blue Butterfly

# Sinai Baton Blue Butterfly

- Sinai Baton Blue butterfly *(Pseudophilotes sinaicus*) is endemic to the mountains of Saint Katherine Protectorate in Egypt.
- The Sinai Baton Blue is a tiny butterfly with a good claim to be the smallest butterfly in the world.
- It is so small that the smallest individual has wings only just over 6 mm long, with females larger than males.

# Sinai Baton Blue Butterfly

- The Sinai Baton Blue butterfly has a highly localized distribution, mainly because of its dependence on Sinai Thyme (*Thymus decussatus*) which occurs as discrete patches in the mountains and is affected by grazing, over-collection for medicinal purposes and the influence of global warming, and this affects the populations of the butterfly.

- This butterfly is a poor flier, and individuals can not usually move more than 100m. The loss of Sinai Thyme patches adversely affects the persistence of the Sinai Baton Blue butterfly. It can lead to extinction of whole populations

# Impacts of Climate Change on Wetland Ecosystems

- Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands include freshwater marshes, and swamps.

**Marsh contains non-woody plants.**

**Swamps–dominated by woody plants, such as trees and shrubs.**

# Impacts of Climate Change on Wetland Ecosystems

- **Why Are Wetlands Important?**
  - Wetlands are among the world's most biologically productive ecosystems and are very important as habitats for fish and wildlife.
  - Some can purify polluted water (Wetlands slow the flow of runoff from uplands before it reaches a river, lake, or other body of water).
  - Others can reduce the impact of floods by temporarily storing flood waters and reduce bank and shoreline erosion
  - Some wetlands provide critical habitat for endangered species.
  - Still others help refill groundwater supplies.

# Impacts of Climate Change on Wetland Ecosystems

- **Why Are Wetlands Important?**

  - Wetlands represent a significant storage reservoir of carbon and other greenhouse gases in the global carbon cycle.
  - 20-30% of global carbon stored in soils is stored in wetlands.

So Increases in global temperatures may release large carbon stores in wetlands, creating a positive feedback loop.

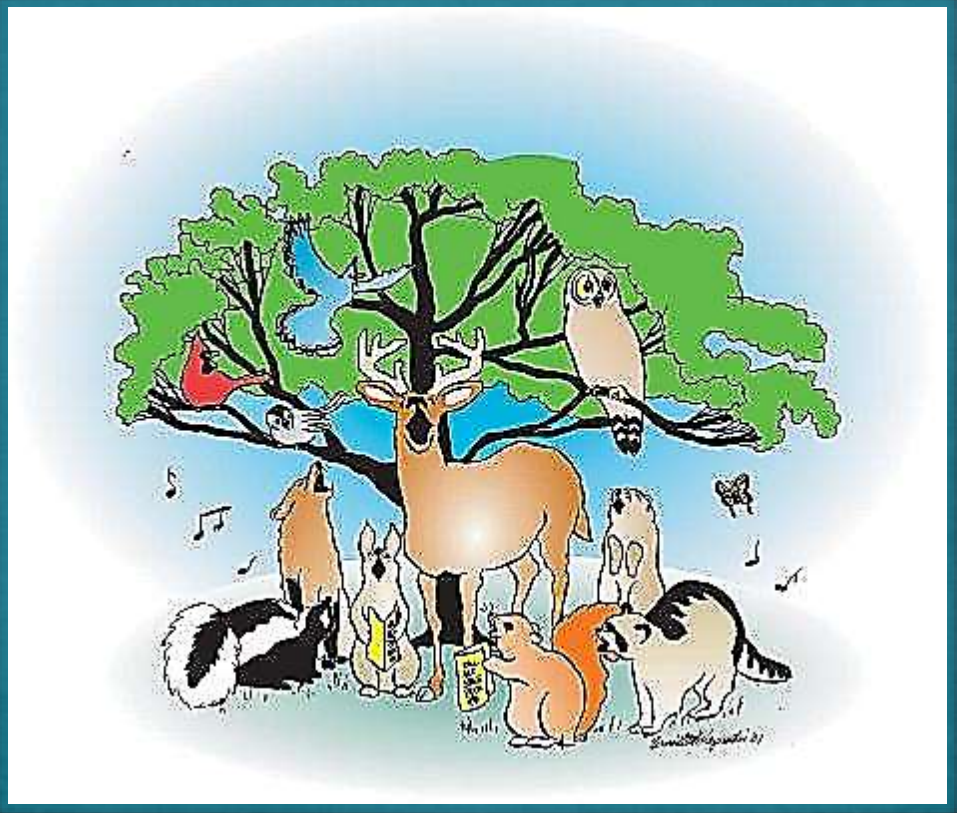
# Impacts of Climate Change on Wetland Ecosystems

- **Impacts of global warming**

  - Temperature will affect both the a biotic(e.g., water quality.) and the biotic compartments (e.g., species range shifts.).
  - Changes in the hydrological cycle together with a rising sea level and increasing storm surges will result in:

  ➢ enhanced erosion of coastal habitats,
  ➢ salinization of groundwater aquifers
  ➢ altered tidal ranges,
  ➢ changes in sediment inputs and nutrient loadings,
  ➢ increased flooding and, consequently in a decrease of freshwater availability for humans and ecosystems.

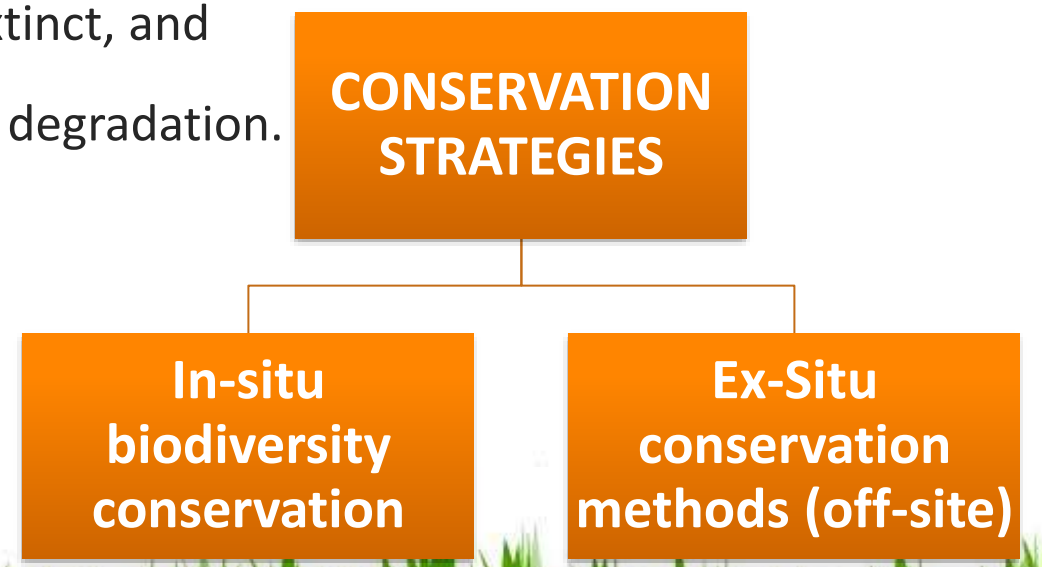
# PART 3: CONSERVATION OF BIODIVERSITY



# CONSERVATION OF BIODIVERSITY

Conservation is the planned management of natural resources, to retain the balance in nature and retain the diversity. It also includes wise use of natural resources in such a way that the needs of present generation are met and at the same time leaving enough for the future generations. Conservation of biodiversity is important to:-

- prevent the loss of genetic diversity of a species
- save a species from becoming extinct, and
- protect ecosystems damage and degradation.



# CONSERVATION OF BIODIVERSITY

**Ex-Situ conservation methods (off-site)**

- Gene banks
- Seed banks
- Sperm and ova banks
- Botanical garden
- Plant tissue and microbial culture
- Captive breeding

# In-situ biodiversity conservation

## A protected areas

“ A protected area is clearly defined geographical space, recognized, dedicated and managed through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values ”

(According to the IUCN)

# Categories of Protected areas?

**The IUCN definition is expanded by six management categories (one with a sub-division), summarized below:**

## I Strict nature reserve & Wilderness area

**أ. حماية محضه للطبيعة : إدارة محمية طبيعية أساساً للأغراض العلمية ، حيث تشمل التنوع البيولوجي، وربما أيضا الخصائص الجيولوجية / الجيومورفولوجية ويتم إحكام السيطرة على الأنشطة البشرية لضمان حماية قيم الحفظ.**

**ب. أراضى برية :إدارة محمية طبيعية تعنى أساساً بحماية الحياة البرية. وهى عبارة عن مساحات لم يتم اتخاذ آية تعديلات فيها ذات مغزى وهى بدون منشآت دائمة ويتم حمايتها وإدارتها لحماية ظروفها الطبيعية .**

# Categories of Protected areas?

**Wilderness area**

# Categories of Protected areas?

2- حدائق وطنية : محمية طبيعية يتم إدارتها أساساً لحماية الأنظمة البيئية والترويحية تستهدف حماية النظم البيئية التى تحتوى على نماذج متباينة من البيئات الطبيعية والمناظر ذات القيمة الجمالية لخدمة الأغراض العلمية والتعليمية والسياحية والترويحية .

# Categories of Protected areas?

3- محمية الأثر الطبيعي : محمية طبيعية يتم إدارتها أساساً لحماية مظاهر طبيعية معينة . وهى منطقة تحتوى على واحدة أو أكثر من الظواهر الطبيعية أو الثقافية ذات قيمة فريدة أو بارزة لأنها نموذج لموروث نادر ذو قيمة جمالية أو خصائص ثقافية يتم حماية تلك الظواهر لأهميتها العلمية والأخلاقية على المستوى القومي .

# Categories of Protected areas?

4- محمية لإدارة الأنواع والموائل

وهى مناطق تخضع لتدخلات إدارية قوية من أجل الحماية والحفاظ على الموائل الطبيعية وتلبية المتطلبات لحماية أنواع معينة من الثروات الطبيعية .

5- محمية المناظر الطبيعية الأرضية والبحرية : محمية طبيعية يتم إدارتها أساساً لحماية المناظر الجمالية الأرضية والبحرية وللترويح .

وهى منطقة ذات صفات خاصة لها قيم إيكولوجية وبيولوجية وثقافية وروحية ، و إن الحفاظ عليها أمر حيوي من أجل الحماية والصيانة والتطور لهذه المنطقة والاحتفاظ بها على أوضاعها الطبيعية لاستخدامها للنزهة والترويح وللأغراض العلمية والتعليمية .

# Categories of Protected areas?

6- محمية إدارة الموارد : محمية طبيعية يتم إدارتها أساساً للاستخدام المستدام للنظم والموارد البيئية الطبيعية

وهى مناطق يتم بها حماية النظم البيئية الطبيعية وما يرتبط بها قيم ثقافية والإدارة التقليدية للموارد الطبيعية. ومن أهدافها تحقيق التورازن بين تلبية احتياجات المجتمعات من الموارد الطبيعية وتحقيق الاستخدام المستدام والأمثل للموارد البيئية الطبيعية لضمان الحماية والصيانة للتنوع البيولوجي على مدى طويل .

# Biodiversity in Egypt

Egypt lies at the northeast corner of Africa at the junction of four biogeographical regions, Irano-Turanian, Mediterranean, Saharo-Sindian and Afrotropical.

Due to its very varied eco-zones, the country is home to a diversity of terrestrial habitats and a fauna and flora.

# Protected areas in Egypt

- Since the passage of Law 102/1983, 30 Protected Areas have been declared. The present network covers almost 18% of the country`s land and marine areas.
- It includes a representative range of habitats and geographic regions, along with other sites of importance such as biodiversity hotspots, cultural heritage sites, geological formations and landscapes of outstanding natural beauty.
- The Protected Areas are of varying size, from the largest, Elba, at about 35,000 km2 to Saluga and Ghazal Islands, at 0.5 km2.

# Protected areas in Egypt

**أهمية المحميات الطبيعية**

إن المحميات الطبيعية هى الأداة الأساسية لصون التنوع الحيوى على الكرة الأرضية وتقوم المحميات الطبيعية بوظائف أساسية نذكر منها:

أ) الصون و المحافظة على النظم البيئية الموجوده فى الطبيعة والتى هى أساس بقاء الإنسان وتطوره ورفاهيته.

ب) استعادة كفاءة النظم البيئية المتدهورة نتيجة لأعمال التنمية مما يحافظ على استقرار البيئة التى تمثلها المحميات.

ت) توفير الفرصة لإحداث واستمرار التنمية في المناطق النائية والاستغلال الأمثل لها مما يعطى بعد الأهمية القومية لتلك المناطق.

ث) البحث العلمى ورصد الظواهر والموارد الطبيعية لإظهار بيانات واضحةتمكن صناع ومتخذى القرار من اتخاذ القرارات المناسبة لتنمية الإنسان.

ج) الترويح والاستجمام والتمتع بالتراث الطبيعى والتراث الثقافى المرتبط به.

# Protected areas in Egypt

**معايير اختيار و إنشاء المحميات الطبيعية:**

يتم اختيار مواقع المحميات تبعا لمعايير عامة يجب أن تكون موجوده فى المواقع المختارة، هذا وتختلف الدول فيما بينها على بعض المعايير الخاصة، وسنعرض فيما يلى بعض المعايير العامة التى تراعى أثناء عملية اختيار وإنشاء المحميات:

أ) **الأهمية العلمية:** وتتمثل بالقيمة العلمية للموقع وما يحتويه من العناصر الطبيعية والفطرية للأنواع أو البيئات والظواهر البيئية الهامة

ب) **الجغرافيا الحيوية:** ويتعلق ذلك المعيار بالخواص الحيوية للمنطقة وتوزيعها مثل الأنواع النادرة أو المهددة بخطر الانقراض والظواهرالغير عادية

ت) **فطرية الموقع:** وتتعلق ببعد الموقع وانعزاله عن التأثيرات الناجمة عن الأنشطة البشرية

ث) **الأهمية البيئية:** وتتعلق بمواقع النظم البيئية الثرية فى تنوعها الحيوى أو تنوع النظم البيئية والحيوية بها. (أنواع هامة/متوطنة/نادرة/مهددة بالانقراض – تكوينات طبيعية/جيولوجية جيومورفولوجية ذات أهمية خاصة – بيئات وأنظمة تتعرضللتغير بفعل النشاط البشرى – أنظمة مرتبطة ببعضها وذات تفاعل مستمر – مواقع ومسارات هجرة الكائنات – وهكذا).

# Protected areas in Egypt

ج) **الأهمية الاقتصادية والاجتماعية:** وتتعلق بكون الموقع ذات مردود اقتصادى كعوائد السياحة وفرص الاستثمار والعمالة والتدريب, ومدى تقبل المجتمع المحلي عمومالفكرة الحماية والصون وانعكاس ذلك اجتماعيا واقتصاديا في رفع المستوى الاجتماعي للسكان المحليين وتحقيق الترفيه والترويح للزائرين.

ح) **الأهمية القومية أو الدولية:** مدى احتواء الموقع على قيمة عالمية استثنائية تندرج تحت برنامج التراث العالمى أو الإنسان والمحيط الحيوي، أو مواقع الطيور الهامة عالميا، أو مواقع الأراضى الرطبة وغيرها .

خ) **الملائمة و إنشاء المحمية عمليا :**

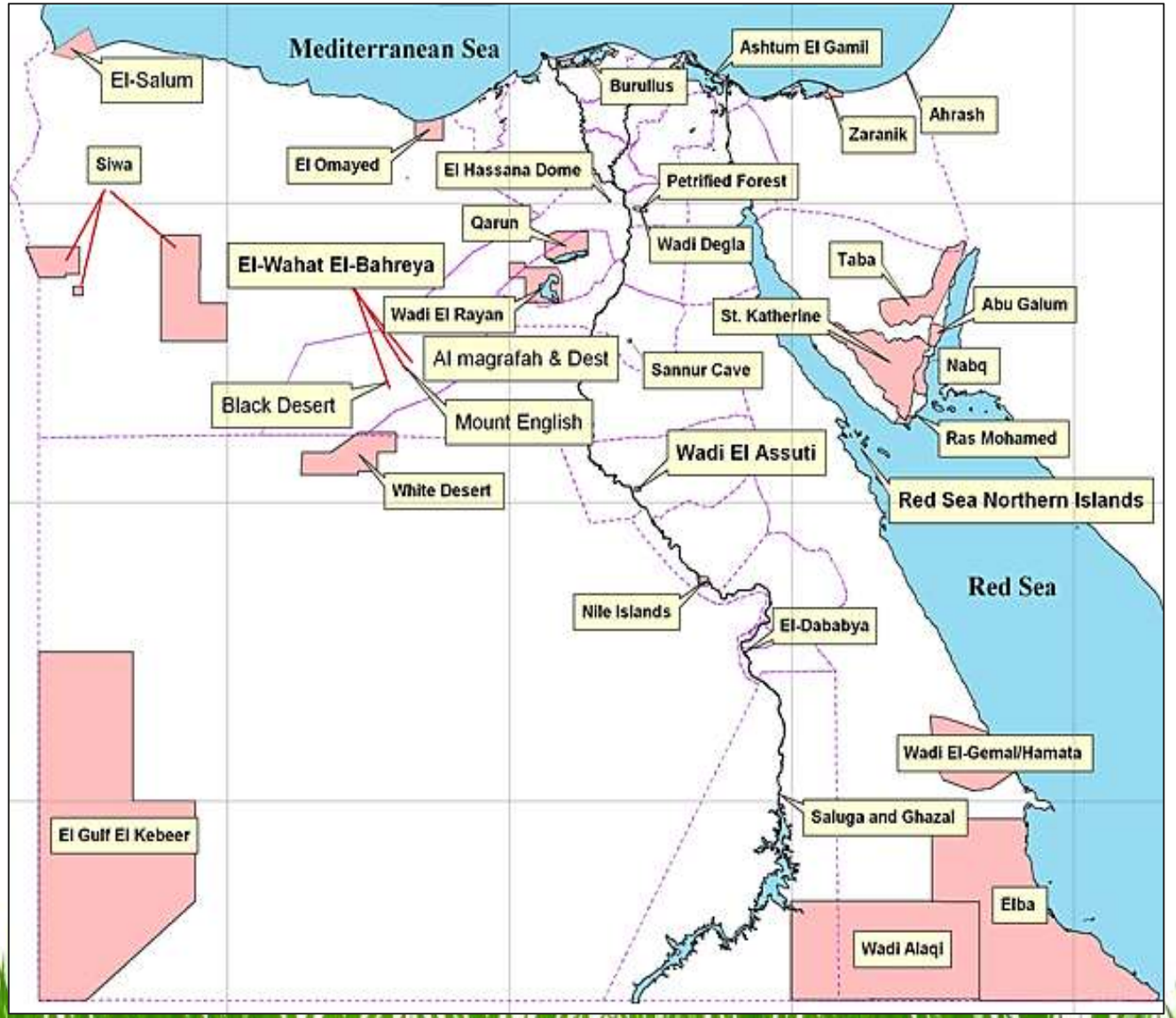
-انعزال الموقع عن التأثيرات والمدخلات الخارجية المؤثرة سلبا.

-قبول الموقع محليا واجتماعيا وسياسيا.

-توافق استخدامات الأراضى مع خطط الدولة التنموية .

-مدى إمكانية متابعة الأنشطة المتعلقة بالصون مثل أنشطة التعليم والترفيه .

# Protected areas in Egypt



# Protected areas in Egypt

| No. | Protectorates Names | Declaration Date | Area $Km^2$ | Governorate |
|---|---|---|---|---|
| 1 | Ras Mohamed National Park | 1983 | 850 | South Sinai |
| 2 | Zaranik Protectorate | 1985 | 230 | North Sinai |
| 3 | Ahrash Protectorate | 1985 | 8 | North Sinai |
| 4 | El Omayed Protectorate | 1986 | 700 | Matrouh |
| 5 | Elba National Park | 1986 | 35600 | Red Sea |
| 6 | Saluga and Ghazal Protectorate | 1986 | 0.5 | Aswan |
| 7 | St. Katherine National Park | 1988 | 4250 | South Sinai |
| 8 | Ashtum El Gamil Protectorate | 1988 | 180 | Port Said |
| 9 | Lake Qarun Protectorate | 1989 | 250 | El Fayoum |
| 10 | Wadi El Rayan Protectorate | 1989 | 1225 | El Fayoum |

# Protected areas in Egypt

| No. | Protectorates Names | Declaration Date | Area Km² | Governorate |
|---|---|---|---|---|
| 11 | Wadi Alaqi Protectorate | 1989 | 30000 | Aswan |
| 12 | Wadi El Assuti Protectorate | 1989 | 35 | Assuit |
| 13 | El Hassana Dome Protectorate | 1989 | 1 | Giza |
| 14 | Petrified Forest Protectorate | 1989 | 7 | Cairo |
| 15 | Sannur Cave Protectorate | 1992 | 12 | Beni Suef |
| 16 | Nabq Protectorate | 1992 | 600 | South Sinai |
| 17 | Abu Galum Protectorate | 1992 | 500 | South Sinai |
| 18 | Taba Protectorate | 1998 | 3595 | South Sinai |
| 19 | Lake Burullus Protectorate | 1998 | 460 | Kafr El Sheikh |
| 20 | Nile Islands Protectorates | 1998 | 160 | All Governorates on the Nile |

# Protected areas in Egypt

| No. | Protectorates Names | Declaration Date | Area $Km^2$ | Governorate |
|---|---|---|---|---|
| 21 | Wadi Degla Protectorate | 1999 | 60 | Cairo |
| 22 | Siwa | 2002 | 7800 | Matrouh |
| 23 | White Desert | 2002 | 3010 | Matrouh |
| 24 | Wadi El-Gemal/Hamata | 2003 | 7450 | Red Sea |
| 25 | Red Sea Northern Islands | 2006 | 1991 | Red Sea |
| 26 | El Gulf El Kebeer | 2007 | 48523 | New Valley |
| 27 | El-Dababya | 2007 | 1 | Qena |
| 28 | El-Salum | 2010 | 383 | Matrouh |
| 29 | El-Wahat El-Bahreya | 2010 | 109 | $6^{th}$ October |
| 30 | Mount Kamel Meteor Protectorate | 2012 | | New Valley |

# Ras Muhammad National Park

# Ras Muhammad National Park

تقع محمية رأس محمد بمحافظة جنوب سيناء وعند التقاء خليجى السويس والعقبة بالبحر الأحمر. و تم إعلان محمية رأس محمد لحماية الشواطئ المرجانية الموجودة فى أعماق المحيط المائى والتنوع الحيوى المميز مثل الأسماك الملونة والسلاحف البحرية المهددة بالإنقراض كالسلاحف الخضراء والأحياء المائية الأخرى مثل الرخويات وشوكيات الجلد والطحالب البحرية وغيرها. وتحيط الشعاب المرجانية برأس محمد من كافة جوانبها كما تشكل طبيعة التكوين الجيومورفولوجى للمنطقة تكوينا فريدا له الأثر الكبير فى تشكيل الحياه الطبيعية للمنطقة.

كما توجد قناة المانجروف التى تفصل بين شبه جزيرة رأس محمد وجزيرة البعيرة بطول حوالى ٢٥٠ م والتى يوجد بها موقع لنباتات الشورى(المانجروف) وهى فى أقصى الحد الجنوبى لرأس محمد. كما تشكل الانهيارات الأرضية " الزلازل " تكوين الكهوف المائية أسفل الجزيرة كما تعتبر المحمية موطن للعديد من الطيور والحيوانات الهامة مثل: الوعل النوبى بالمناطق الجبلية وأنواع الثدييات الصغيرة والزواحف والحشرات ،كما أن المحمية موطن للعديد من الطيور الهامة مثل البلشونات والنوارس.

وتعتبر رأس محمد من المناطق الهامة عالميا للطيور وإحدى أهم مسارات هجرة الطيور فوق جمهورية مصر العربية حيث تم رصد حوالى ٢٤١ نوعا من الطيور. أحد أجمل أماكن الغطس فى العالم ولوجود حفربات لشعاب مرجانية تتراوح أعمارها من ٧٥ ألف سنه و ٢٠ مليون سنه، وتشمل ٢٠٨ نوعا من الشعاب الصلبة والرخوة.

# Ras Muhammad National Park

- Littoral habitats include a mangrove community, salt marshes and intertidal flats.
- The Park protects reefs, breeding grounds for globally threatened seabirds and marine turtles.
- Adjoining sea grass beds are feeding sites for the rare Dugong.

# Ras Muhammad National Park

- The Park also harbors a diversity of desert mountain and wadi habitats, gravel plains and sand dunes, and the area is an internationally important concentration point for migratory soaring birds.
- The majority of White Storks, some 250,000, breeding in Central and Eastern Europe pass through the Ras Muhammad National Park every year in late summer and autumn.

# St. Katherine protectorate

# St. Katherine protectorate (SKP)

- **St. Katherine protectorate (SKP)** had been declared as a protected area in 1996 due to its biological and cultural interest, with an area about 4,350 $km^2$ .
- SKP includes Egypt's highest mountains, which support a unique collection of high altitude ecosystems, with a high diverse fauna and flora
- SKP highest region is the coolest place in Egypt and the only one to have snow.

# St. Katherine protectorate (SKP)

- SKP includes greatest places, with enormous cultural, religious and biological significance.
- Monastery of St. Katherine and the archaeological sites associated with it, attract a large tourist visitation

# St. Katherine protectorate (SKP)

- SKP has been recognized by the IUCN as one of the most important regions for flora diversity in the Middle East.
- Some 472 plant species, representing almost 40% of Egypt`s total flora, are found in this region, and nearly half of the 33 known plants endemic to Sinai are found there, many of them rare and endangered.
- The Bedouin in southern Sinai are reported to use over 170 plants to treat medical disorders from colds and indigestion to bites and stings. Within SKP Sustainable collection methods are being introduced and grazing areas are being managed, to relieve pressure on endangered plant species.

# St. Katherine protectorate (SKP)

*Alkanna orientalis*

*Centaurea eryngioides*

# St. Katherine protectorate (SKP)

*Echinops spinosus (After MPCP, 2012)*

*Fagonia mollis*

# St. Katherine protectorate (SKP)

*Globularia arabica*
*(After MPCP, 2012)*

*Origanum sinaicum*

# St. Katherine protectorate (SKP)

*Peganum harmala*

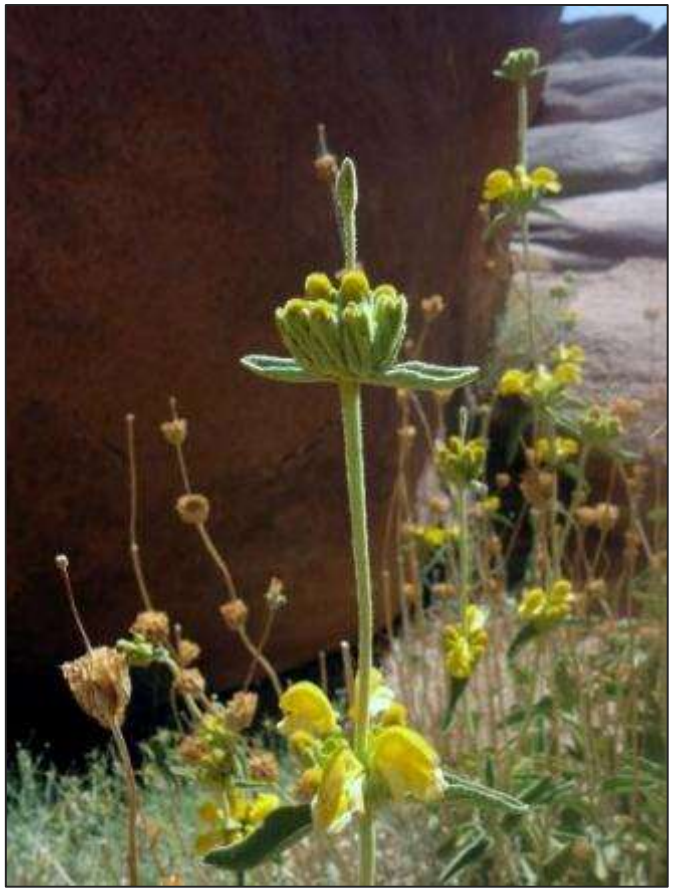
*Seriphidium herba-album*

# St. Katherine protectorate (SKP)

*Tanacetum sinaicum*

*Thymus decussatus*

# St. Katherine protectorate (SKP)



*Phlomis aurea*

*Verbascum sinaiticum*

# St. Katherine protectorate (SKP)

- The St. Katherine region is equally rich in fauna, with several species not found elsewhere in Egypt or the world.
- Sinai's endemic fauna is found together with relict species from elsewhere: Sinai rose finch (*Carpodacus synoicus*) from Asia, ibex (*Capra nubiana*) and perhaps wolf (*Canis lupus arabs*) from Europe, and striped hyena (*Hyaena hyaena*) and Tristram's grackle (*Onychognathus tristramii*) from Africa.

# Funa biodiversity

Sinai barbastella خفاش سيناء

(*Barbastella leucomelas*)

Red fox الثعلب الأحمر

(*Vulpes vulpes*)

Dorcas gazelle الغزال العفرى

(*Gazella dorcas littoralis*)

Stripped Hyena الضبع المخطط

(*Hyaena hyaena*)

Stripped Hyena الضبع المخطط

(*Hyaena hyaena*)

Nubian Ibex الماعز الجبلى

(*Capra ibex nubiana*)

Rock Hyrax الوبر

(*Procavia capensis*)

Arabian wolf الذئب العربى

(*Canis lupus*)

Bosc's Lizard عربانة

(*Acanthodactylus boskianus*)

Sinai agama قاضى سيناء

(*Pseudotrapelus sinaitus female*)

Sinai agama قاضى سيناء

(*Pseudotrapelus sinaitus male*)

Horned viper الحية المقرنة

(*Cerastes cerastes*)

Starred Agama الحرذون

(*Laudeckia Stellio*)

Ornate dabb lizard ضب سيناء
(*Uromastyx ornate*)

Western honey buzzard الصقر الحوام

(*Pernis apivorous*)

Bee eater آكل النحل

(*Merops apiaster*)

Sinai Rosefinch العصفور الوردى السينائى

(*Carpodacus synoicus*)

White Crowned Black Wheatear الأبلق

(*Oenanthe leucopyga*)

Blackstart حميراء سوداء
(*Cercomela melanura*)

Chiffchaff نقشارة

(*Phylloscopus collybita*)

Desert Lark قنبرة الصحراء المتوجة

(*Ammomanes deserti*)

Chukar partridge الشنار

(*Alectoris chukar*)

sun spider عنكبوت الشمس

(*Galeodes sp .*)

# St. Katherine protectorate (SKP)

- The Protectorate is an Important Bird Area (Baha El Din 1999) and is one of the most important places in Egypt for insects: two-thirds of Egypt's butterflies occur here (Larsen 1990), including two endemics, of which one, the tiny Sinai baton blue (Pseudophilotes sinaicus), is probably the smallest butterfly in the world, with its entire world range restricted to a few square kilometres centred on Mt Sinai itself.

# Wadi El Hitan: A model of climate change through ancient times

# Wadi El Hitan was designated a UNESCO World Heritage Site in July 2005

Wadi El Hitan represents a unique museum of natural history of the area where there are more than 1,500 initial skeleton of whales and mermaids , which is belonged to the age of about 40-42 million years .

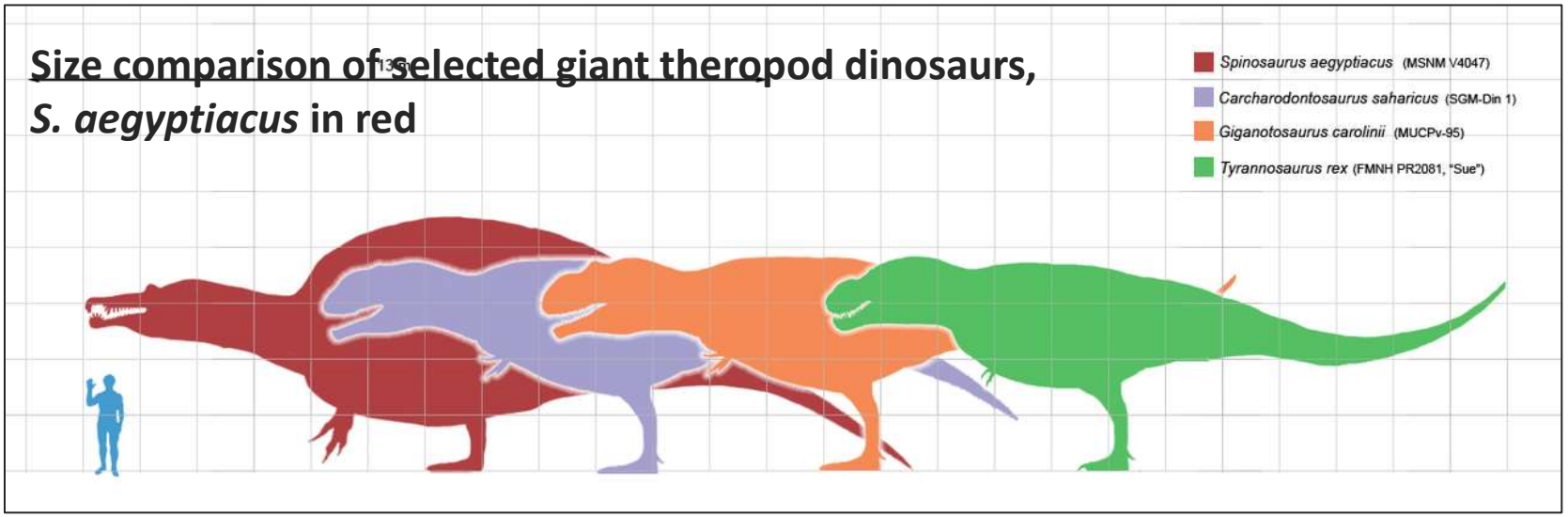
This region was considered the seabed of the old sea “Tethys *sea”* which linked between the Mediterranean Sea and the Indian Ocean

# Mount qatrany in qarun protectorate witness to climatic changes in ancient times

# *Spinosaurus aegyptiacus*

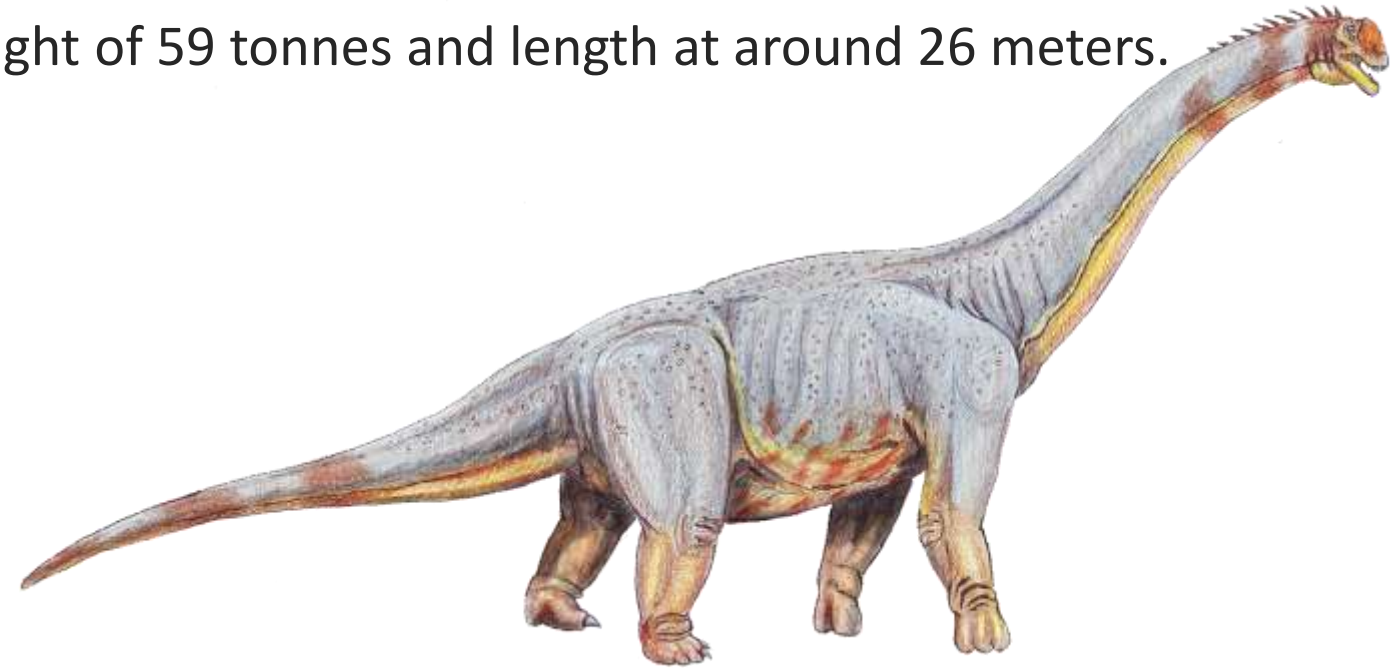
# *Spinosaurus aegyptiacus*

- It was among the largest of all known carnivorous dinosaurs, it was between 12.6–18 meters in length and 7 to 20.9 tons in weight. *Spinosaurus* lived in what now is North Africa when it was submerged under water, during the Cretaceous period, about 112 to 97 million years ago.
- This genus was discovered first from the western desert of Egypt in 1912 and described by German paleontologist Ernst Stromer in 1915.



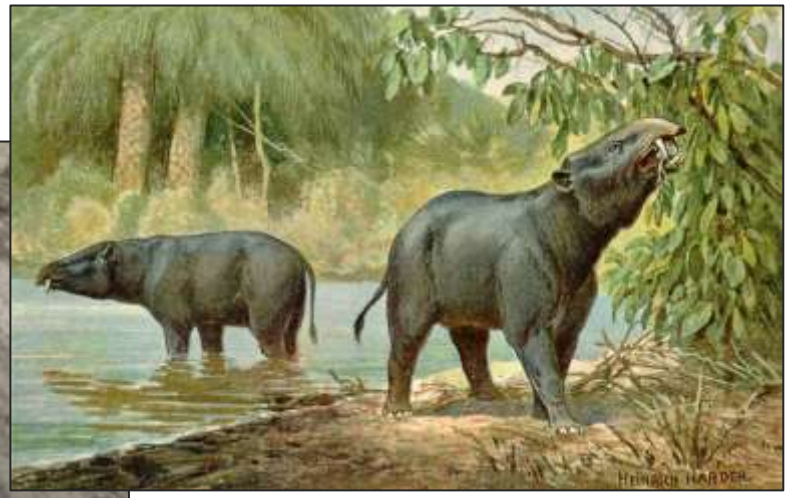
# *Paralititan stromeri*

- *Paralititan stromeri* was a giant titanosaurian sauropod dinosaur genus discovered in coastal deposits in the Upper Cretaceous Bahariya Formation of Egypt.
- It lived between 98 and 93 million years ago. It was considered to be the second largest known creature ever to walk on Earth. With an estimated weight of 59 tonnes and length at around 26 meters.



# *Moeritherium*

***Moeritherium*** **('the beast from Lake Moeris') is a genus consisting of several extinct species. These prehistoric mammals are related to the elephant and, more distantly, the sea cow. They lived during the Eocene epoch about 35-37 million years ago, the shape of their teeth suggests that they ate soft water vegetation.**



# PART 4: climate change mitigation

# Simple ways to act on climate change

- Limiting the use of fossil fuels such as oil, carbon and natural gas and replacing them with renewable and cleaner sources of energy.

# Simple ways to act on climate change

- **Leave the car at home**: Going car-free was the number-one most effective action an individual could take.

# Simple ways to act on climate change

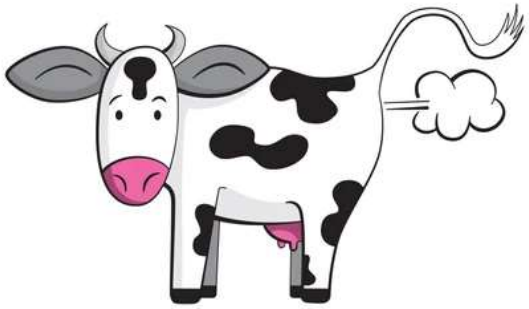
- **Eat less meat and dairy:**

In fact, after fossil fuels, the food industry – and in particular the meat and dairy sector – is one of the most important contributors to climate change.

# Simple ways to act on climate change

**The meat industry contributes to global warming in three major ways.**

1. **cows' burping / cow belching or cow flatulence from processing food releases lots of methane, a greenhouse gas.**
2. **Secondly, we feed them with other potential sources of food, like maize and soy, that require lots of water, fertilizers that can release greenhouse gases**
3. **plenty of land – some of which come from cleared forests, another source of carbon emissions.**



# Simple ways to act on climate change

- **How harmful are my flying habits:**

A normal transatlantic round-trip flight can release around 1.6 tonnes of CO2.

# Simple ways to act on climate change

- **Should I think about how many children I have:**

Several studies concluded that having fewer children is the best way to reduce your contribution to climate change

# Simple ways to act on climate change

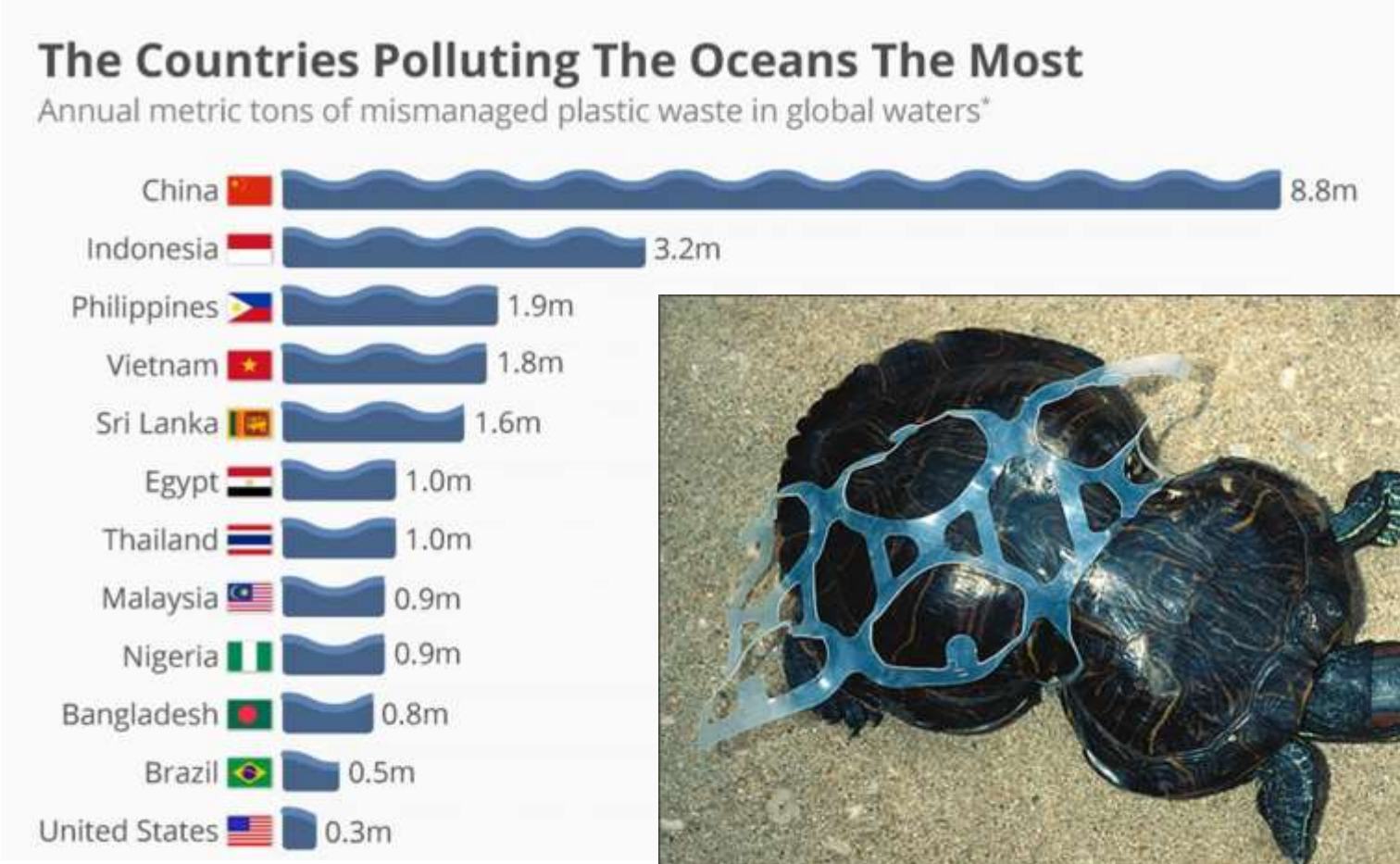
- **Reduce your energy use, and bills: Use energy wisely — and save money too!**

# Simple ways to act on climate change

- **Respect and protect green spaces:**

# Simple ways to act on climate change

- **Cut consumption – and waste: Try to minimise waste**





Thanks