

BEST PRACTICE GUIDELINES FOR GOLF COURSE DEVELOPMENT ON THE RED SEA COAST (DRAFT, MAY 2002)

SECTION 'HI'

ENVIRONMENTAL BEST PRACTICE GUIDELINES FOR GOLF COURSES ON THE RED SEA COAST

EGYPTIAN TOURISM DEVELOPMENT AUTHORITY

RED SEA SUSTAINABLE TOURISM INITIATIVE COMMITTED TO GREEN

FOUNDATION

GOOD PRACTICE GUIDELINES FOR RED SEA GOLF COURSES

INTRODUCTION

The Environmental Screening process using a Site Evaluation Checklist, Project Description sheet and Environmental Assessment Review Checklist, will ensure that all the relevant environmental aspects are factored into a development. The remaining element is information on appropriate practices to maximize the environmental compatibility of desert golf courses.

In many respects, this is tautological. Growing turf grass and managing a golf course in a hot desert does not come naturally. It inevitably consumes large amounts of resources and creates an artificial looking situation. But, seen in the wider context of the regional tourism development strategy, there are many ways and means for ensuring that golf courses form an integral part of the overall program, and that they are designed, built and managed in the most environmentally responsible way.

The following guidelines cannot cover all eventualities. They are intended as pointers to help golf architects and golf course managers achieve the best environmental solutions. In many cases these will be the best or only options given the extreme environmental conditions along the Red Sea Coast.

LANDSCAPE AND THE NATURAL ENVIRONMENT

Creating a 'desert style' golf courses

The two existing golf courses on the Red Sea Coast, at Soma Bay and El Gouna, offer contrasting styles. The Cascades Golf Course at Soma Bay, is an extensive layout, making considerable use of the open desert landscape. Most holes are individual, in that you cannot see other holes close by. It is a high specification golf course and is more expensive to maintain than the Steigenberger Golf Course at El Gouna, which is more compact in layout. The resort of El Gouna surrounds most of the golf course, giving it a very different feel from the open situation at Soma Bay.

In short, at El Gouna you know you are in a resort, whereas at Soma Bay you know you are in the desert. In terms of attention to detail, especially in the shaping of the course, minimising of turfgrass area, use of sandy waste areas and landscape planting, the Cascades Golf Course scores very highly. It is a good model for a 'desert style' golf course.

Key points for achieving the best integration into the desert environment include:

- The golf course site area should be extensive (preferably 100 hectares or more), and have a gently undulating landform to create visual interest without requiring significant reshaping.
- The area laid to turfgrass should be minimised. This should comprise, discrete tees, short fairways and minimal rough. The carries and lateral areas can be set out as open sandy and/or stony waste, with sparse planting.
- The landscaping selection should be dominated by indigenous, or regionally native plant species, which are best adapted for this environment. Examples of appropriate species can be found along the more lush sections of wadis. Ideally, the opportunity should be used to recreate an Eastern Desert flora, rather than a collation of New World and Middle Eastern species.
- Bunkers, cart paths, tee markers and other golf course furniture should be made from local materials, whose texture and colours blend with the surrounds.

Ecological management

Golf courses along the Red Sea Coast create an oasis effect. The simple presence of lush vegetation, whatever its origins, will attract a wide variety of bird species, especially during migration time. Even the open turfgrass areas can serve as significant feeding habitats for migrants. This also has the beneficial side effect of natural pest control. Both Superintendents at Soma Bay and El Gouna, recognised the value of insectivorous birds feeding on the golf courses. They also confirmed that pesticide usage was negligible, due to the non-occurrence of fungal diseases and the natural controls on most insects provided by birds.

Bird species seen feeding on turfgrass areas at Soma Bay, early March 2002:

Little stint	<i>Calidris minuta</i>
Hoopoe	<i>Upupa epops</i>
Red-throated pipit	<i>ANTHUS CERVINUS</i>
White wagtail	<i>Motacilla alba</i>
Black-headed wagtail	<i>Motacillaflava feldegg</i>
Sedge warbler	<i>Acrocephalus schoenobaenus</i>
Chiffchaff	<i>Phylloscopus collybita</i>

Stonechat	<i>Saxicola torquata</i>
Desert wheatear	<i>Oenanthe deserti</i>
Isabelline wheatear	<i>Oenanthe isabellina</i>
Bluethroat	<i>Luscinia svecica</i>
Spanish sparrow	<i>Passer hispaniolensis</i>

This is an unusual assemblage and suggests a very transient population. Over time a much greater range of species could be anticipated: see *Pharaoh's Birds*, J Miles 1998.

Clearly, in a desert environment it is not practical to establish large areas of vegetated habitat. This is why the golf course turfgrass areas are so attractive to birds. However, some wider variety of plants, particularly flowering and fruit-bearing shrubs in the landscaping areas, will help to create valuable cover habitat. Perhaps obviously, one of the major ecological features of the Red Sea Coast region is the shoreline itself. The beaches are important feeding and resting grounds for different kinds of wading bird, while the off-shore shallow waters, up to and just beyond the coral reefs, are important feeding areas for gulls, terns and osprey (*Pandion haliaetus*). Golf courses can provide a significant buffer zone between the shoreline and the hard development areas of resorts. This is a good use of the set back zone, allowing an economic activity, yet preventing undue development and disturbance along significant sections of shoreline. Soma Bay and El Gouna provide very contrasting examples of this principle in operation.

Although the ecological benefits of desert golf courses are more happy side effects than primary goals, there are some worthwhile measures that can be implemented to increase biodiversity:

- Include insect-attracting and fruit-bearing shrubs in the landscaping areas.
- Provide small thickets of shrubby vegetation to give shelter for migrant birds.
- Establish golf courses as buffer zones to protect sensitive shorelines.
- Monitor occurrence of different bird species visiting the golf course and note where and how they utilise the site. This will provide interesting data and may indicate preferred habitat conditions, which could be replicated elsewhere.

WATER RESOURCE MANAGEMENT

The water consumption of turf depends on a wide range of factors such as:

- the climate
- the soil morphology and structure
- the make up and type of turf
- the exposure and the wind

Any golf course in the Red Sea Coast region will be a high consumer of water. In such an extreme environment, every drop of water has to be used carefully. However, in theory there are some golf course irrigation strategies that would be less critical for conserving water resources than others:

- Irrigating with desalinated seawater produced using renewable energy, and where the brine waste is disposed of correctly without impact on the marine environment. In such circumstances, water and energy use could be relatively limitless - up to the capacity of the energy supply and desalination plants. The reality is that there is no current capacity for renewable energy in the Red Sea region, so desalinated water for golf courses here is not a recommended option.
- Irrigating with treated effluent water. This is a good use of a waste product and the extra filtration provided by turfgrass will create an additional water quality safeguard. However, this only works where there is sufficient volume of waste water being produced by hotels and related tourist facilities. Not only do the hotels create an initial demand for fresh water, but the supply of waste will follow the peaks and troughs of hotel occupancy. Unless the minimum levels of occupancy are sufficient to produce enough waste water for golf course use, this is an unreliable option. It can only be used as part of a mixed supply package, which then gives the problem of maintaining a consistent level of water quality.
- Irrigating with seawater, or other saline water sources. Theoretically the perfect solution, as this does not impact on freshwater provision, nor does it require energy for desalination. The downsides are potential salt build up in the soil profile, with possible long-term detrimental impact on the golf course, and the need for non saline water during the grow-in period and for occasional salt flushing. This means that a golf course can only function using seawater, provided there is a parallel supply system for freshwater.

Under present circumstances and technical knowledge, the best that can be anticipated is to utilise a mix of water types, in which the use of seawater, saline aquifer water and/or treated effluent, helps to minimise the reliance on potable water sources. This points to a number of practical measures, necessary to handle mixed supply.

Large volume storage tanks for holding individual supply types and the means to mix these types consistently before entering the irrigation system. Thus, rather than take treated effluent on an as it comes basis, feed it into the system in as constant a way as possible. While certain turfgrasses can thrive on poor water quality, continual variation in the type of water will cause stresses, and makes the golf course management all the more complex.

[It is assumed these tanks will be covered reservoirs, to avoid evaporation losses.]

- Ensure regular water quality monitoring and maintain detailed records. Salinity, pH, nutrient balance must all be frequently checked.
- Use Seashore Paspalum throughout for all golf turf and landscape with high salt tolerant plants. This will avoid the cost of installing a dual piping, sprinkler and pump system, such as they have at El Gouna because the Bermuda grass on the putting greens cannot tolerate the salinity of the water used on the Seashore Paspalum fairways and tees.

Irrespective of whether one has a restricted or limited water supply, it is essential to be economical with the use of water. Not only does excess water use require more energy (irrigation pumping) and causes wear and tear on irrigation equipment, it is bad turf management. Over watering is not good for turfgrass quality. Curiously, in many situations where water is naturally scarce, there seems to be a psychological urge to over do the irrigation, as though the plants will take as much as one can give them. Even in the desert one can irrigate too much.

It is essential for the Superintendent to have control over every aspect of the irrigation programme, so in these high water demanding golf courses, only the top state-of-the-art computerised irrigation systems will do. There should be a fully programmable system, with satellites for each sprinkler group, allowing for localised watering with precise distribution control. The system should be linked to an on-site weather station, to allow accurate programming of irrigation in respect of evapo-transpiration rates.

When to irrigate

It is necessary to irrigate when the grass starts to wilt, before this phenomenon becomes [permanent](#). In order to avoid too much stress and to optimise water consumption. This can be evaluated by walking on turf since when wilting starts leaves are no longer turgid enough to immediately straighten up, or by observing the soil profile and the humidity level.

It is preferable to irrigate not so frequently, but abundantly so as to obtain a deeper root system and to prevent water drops from remaining on leaves for a long time. Irrigation during the night reduces water losses due to evaporation and transpiration. Turf should not be irrigated when high traffic is expected, otherwise soil compaction increases.

The perfect timing should maintain the water level in the soil at above 50% of the total. Oversupply reduces the growth of shoots and roots. As a result turf will need more water and will be less resistant to traffic, heat, cold, drought and to fungal diseases - even if the latter are not normally a problem in the Red Sea region.

How much to irrigate

The amount of water to be supplied depends not only on the turf grass species but also on the duration of irrigation that should be sufficient to wet the turf root system (15-20 cm of soil). In addition, it should be closely related to the infiltration velocity, in that excess water might be lost through run-off. Compact soils have a very low infiltration rate, between 1.2 and 2.5 mm/h. In this case it is preferable to irrigate lightly and more frequently.

Case study

Extract from Committed to Green Environmental Statement of Belas Campo de Golf, near Lisbon, Portugal (October 2000)

"Written procedures were compiled for irrigation of the golf course, the main objective being to save water. This also facilitates and benefits the duties of irrigation staff, and avoids mistakes or omissions that would lead to excessive water consumption. Staff adhere strictly to these procedures which include a series of instructions to improve irrigation efficiency, such as: night-time sprinkling; on the spot inspections and daily adjustment of the system if required and in spite of it being modern equipment; detection of leaks; detection of sprinkler breakdowns; manually controlled sprinkling of isolated areas; the timing of irrigation periods and weather conditions, etc. All the staff who operate the system are suitably prepared to carry out their duties effectively.

Monthly water quality analyses are carried out with portable in-house apparatus, of the pH, dissolved oxygen, nitrate, nitrite and ammonia contents. Every six months, or as required, reliable external laboratories are used to provide more complete analyses.

Other measures were taken in order to optimize consumption of water, such as the use of low pressure water pumps and/or air compressors to clean machinery, the planting of trees to reduce losses due to evaporation and wind factors, and the planting of shrubs close to larger trees to be able to use condensation from summer mists that drip from tree foliage. A survey was also made of sprinklers that irrigate unnecessary areas and require replacement. With regard to general water consumption, internal circulars are issued frequently and sent to employees exhorting them to save water at the offices and other areas."

TURFGRASS MANAGEMENT

Turf grass selection

Three main turfgrass types are currently in use on the existing Red Sea golf courses: Bermuda (*Cynodon spp.*), Seashore Paspalum (*Paspalum vaginatum*) and Kikuyu Grass (*Pennisetum clandestinum*). Each of these is a warm season turfgrass and is therefore appropriate for the region. While they may have overall similar requirements in terms of water quantity in this climatic zone, they differ in the type of water quality they can tolerate. The final selection can therefore make a major difference to the presentation and management of the golf course.

The consensus across the turfgrass industry these days is to favour Seashore Paspalum in arid environments. This can be used on putting greens and fairways, tees and rough, providing a good quality playing surface throughout. It may not meet international championship standards of conventional tournament courses, but given the primary market in the Red Sea region is for winter tourism from Europe, Seashore Paspalum offers the best solution. In any case a research programme to evaluate cultivars performances is strongly suggested.

Bermuda Tifdwarf greens are maintained on both main courses. These were of consistently good standard. However, when used alongside Seashore Paspalum fairways, there is the need for a dual irrigation system - as at El Gouna - which is more complex and costly.

In choosing the most appropriate turfgrass for a golf course, one should be conscious of the intended levels of play and proposed maintenance budget. In the Red Sea Coast region, there is not the luxury of so much choice, especially when poor quality irrigation water will force the choice more and more towards Seashore Paspalum. Therefore, the planning of the golf development must recognise the maintenance needs of this turfgrass and budget accordingly. This will be fundamental to the ultimate viability of the project.

Seashore Paspalum

Seashore Paspalum is a warm season perennial grass. It is native to East Central South America, from Argentina through Uruguay and into Brazil. Today, Paspalum grows in tropical areas throughout the world. It does not produce highly viable seed, and therefore must be propagated vegetatively. Propagation can be achieved by using stolons, rhizomes, verticuttings, or sprigs.

Paspalum can be watered with sea water. It has the highest salt tolerance of all turfgrasses, and there are now golf courses throughout the world that use saltwater as their source of irrigation. This does not apply in the grow-in period. Salt loads in the range 5000-10000ppm can just about be tolerated at this stage but the management will be difficult due to the growth regulator effect of salt water. Mature turf is very salt tolerant, provided it is managed correctly.

It is, however, beneficial to be able to water with freshwater from time to time in order to alleviate the build up of salts in the soil. Paspalum will also tolerate reclaimed or recycled water. After a period of time, Bermuda grass cannot handle recycled water and begins to suffer. Where the Bermuda suffers, the Paspalum will continue to thrive. The same goes for golf courses that have desalinisation plants. This water can still have a higher content of salt that can be damaging to Bermuda grass.

Paspalum has high shoot densities and as a result is much more competitive against weeds than other grasses. This competitiveness will undoubtedly keep the use of herbicides to a minimum. If for some reason there is a need for weed control, one could use saltwater.

There are almost no known pests to deal with. Pesticides in general will not be necessary like they are for other turfgrasses.

Seashore Paspalum can potentially use 30 - 50% less nitrogen than Bermuda grass under similar conditions. It also tolerates a wide range in pH from 4 - 10. However, it has a propensity for Ca, P, K, Mg and Mn, so continuous spoon feeding is important for good turf performance.

Recuperative ability is similar to Bermuda grass but the recovery comes from rhizomes not stolons. The two grasses also have similar insect resistance.

Seashore Paspalum is shade and drought tolerant. It is compatible with cool season grasses used to overseed on golf courses, and can be mown at heights as low as an 3mm. This grass also responds well to being verticut. The amount of verticutting depends on the amount of play and the type of surface one desires. Paspalum responds well to regularly scheduled verticuttings and will tighten up.

It is an excellent deterrent against beach erosion. Since it is native to sand dunes throughout the world, it thrives in coastal areas. All these reasons make Seashore Paspalum an excellent choice for the golf industry. The only real negative aspect is poor cold tolerance, but this is not such an issue in the Red Sea region, although at El Gouna there was some indication of partial winter dormancy. Among the warm season grasses, Seashore Paspalum can be slow to come out of winter dormancy.

Summary of attributes of seashore paspalum:

- can be maintained at about 50% of the overhead costs compared to hybrid bermudagrass
- salt/salinity tolerance up to ocean water salt levels (54 dSm⁻¹ or 34,486 ppm)
- soil pH range of 3.6 to 10.2
- excellent drought tolerance when managed properly. Can perform adequately with 50% of the normal --
- water volumes used on hybrid bermudagrass
- water logging/low oxygen stress tolerance (can be inundated for short time intervals with no/minimal detrimental effects)
- low light intensity tolerance, caused by prolonged cloudy - foggy - rainy weather conditions or reduced light conditions in domed sports stadiums
- wear and traffic tolerance similar to Bermuda grass
- forms both rhizomes and stolons
- low mowing height tolerance, with optimum range - 3 mm to 13 mm
- can be overseeded with most cool season grasses
- capability to root and persist equally well in pure sands, heavy clays, mucks or bogs
- can survive in saline or sodic soils with proper management
- capability to effectively and efficiently take up heavy metals or other contaminants (phyto-accumulation)
- capability for providing an effective buffer zone in environmentally sensitive areas
- chilling tolerance than provides the capability for prolonged colour retention in the fall (it is the last warm season grass to go off colour)

Full guidelines on agronomic management practices for Seashore Paspalum are widely available on the internet. Good examples include:

http://www.floridaturf.com/_turfcult/nutshell._html and
<http://www.griffin.peachnet.edu/cssci/turf/paspalum/paspalum.htm>

Golf Course Cultural Practices

The cultural practices that produce and sustain a healthy turf are mowing, irrigation, fertilizer applications and cultivation. These operations, alone or in combination, often cause changes in the root and canopy micro-environment. These changes can have either a positive or negative effect. Thus, it is essential that these practices are executed in a proper and timely manner to ensure turfgrass quality and playability. The best deterrent to weed, insect and disease infestation is a healthy turf. Thus, maintaining hearty grasses will minimize the need to apply fertilisers and pesticides.

Mowing

Mowing is the most basic maintenance operation on a golf course. Without regular mowing at the appropriate heights of cut, the course would become unplayable. With good mowing practices, density, texture, colour, root development, wear tolerance and other aspects of turf quality are enhanced. Proper mowing practices also can reduce the amount of irrigation needed. Taller grass can have a significantly higher evapotranspiration rate and thus a greater need for water. Mowing grass too short stresses the turf which not only produces a need for more water, but can cause the weakened turf to be more susceptible to weed, insect and disease infestation.

Mowing height and growth rate have the most influence on mowing frequency. Mowing is done often enough so that no more than one-third of the leaf is removed at any cutting. Frequent mowing is best because it minimises the negative effect on photosynthesis, and helps maintain a high percentage of leaf surface which is necessary for healthy root development. Mowing frequency is determined by monitoring the rate of grass growth and adjusted as necessary.

If mowing is scheduled at appropriate intervals and the grass clippings are dispersed uniformly, leaving the clippings on turf areas does not cause problems. Research has indicated that returning clippings to the surface does not greatly increase thatch buildup on turf that is otherwise properly managed. Clippings decompose rapidly, thus returning some fertiliser and organic matter to the soil, and they also help conserve moisture and insulate the soil. Clippings should always be removed from greens and tees to prevent interference with the play. Clippings can be returned in fairways and rough unless they are of a sufficient quantity to interfere with play.

Cultivation Practices

To help develop and sustain quality turf, vertical mowing, aerifying, and topdressing are used. These operations physically alter the plant's environment by removing and or relocating soil and organic materials or altering turf growth habit.

Vertical cutting

When done on a timely basis, vertical mowing is used to remove mower induced grain on greens and reduce thatch. In addition, vertical mowing is used to thin turf so that a better job of reel mowing can be done. Also, vertical mowing is used to separate the soil from aerifier cores and mix the soil with the sand used to fill the aerifier holes and topdress the playing surface. Vertical mowing of all areas should be performed on a periodic basis. Double verticutting can be used to reduce the thatch and relieve surface compaction.

Aerification

The main purpose of aerification is to relieve surface compaction which in turn improves surface water infiltration, allows for good root penetration, provides for easier air exchange in the soil, improves nutrient uptake, removes excess thatch and increases turfgrass vigor. Two types of aerification are used. 1) Coring involves removing plugs from the soil profile, thus allowing for lateral expansion of the remaining soil thereby relieving soil compaction. This is accomplished using an aerifier equipped with hollow coring tines. 2) Aerifying by using solid coring tines, or water injection can provide benefits to the soil by improving infiltration and soil aeration, but they do not relieve soil compaction.

Topdressing

Topdressing is used to aid in thatch decomposition, lessen grain development in the turf, stimulate new shoot growth, encourage stolon rooting and make the ball roll true and faster. Although a small amount of thatch (< 1/2 inch thick) is desirable to provide a certain amount of resiliency, thatch is the greatest single limiting factor in the development of fast, uniform greens. Although topdressing does not prevent the development of stems and roots which contribute to thatch buildup, it does keep the thatch separated to prevent dense, compacted mats from forming. By mixing suitable topdressing materials with the organic material, thatch layers, as such, will not develop and thatch will decompose faster. Topdressing of all areas, but more frequently the putting greens, should be routinely used as a thatch control approach.

Fertiliser applications

For environment-friendly turf maintenance to succeed, fertiliser applications must be conducted accurately. They should be conducted according to the results of the chemical and physical analyses of the soil (and leaf tissues if possible). This should optimise nutrition requirements and avoid applying too much fertiliser.

When to apply fertilisers

To avoid wasting money on fertilisers and creating damage, they should be applied in the peak growth period. It is necessary to avoid applying nitrogen in late autumn, late winter or in the summer, because this makes turf very sensitive to fungal diseases and abiotic stresses.

In addition, it is important not to apply too much fertiliser at irregular intervals so as to avoid growth peaks and the risk of product loss due to leaching. On the basis of the chemical analyses of the soil, before these periods (winter in particular), it might be useful to apply potassium-rich fertilisers in order to increase the turf natural resistance. The start of the growth period can be evaluated by means of a small weather station, that can also be used for monitoring. Phosphorous that has little or no mobility in the soil, should be supplied at the time of coring or vertidrainage. A high phosphorous content in the soil increases the presence of *Poa annua* on turf. This weed grass species is not currently prevalent along the Red Sea Coast but is a considerable problem on golf courses around Cairo.

How much fertiliser to apply

The amount of fertiliser to apply should be enough to maintain turf in good conditions. Therefore it depends on:

- the turf grass species and their consumption requirements
- the nature of the soil (some fertiliser can be immobilised in the soil)
- the type of fertiliser used (if it easily subject to leaching it must be applied in very small amounts and frequently)

- the turf growth rate
- the method of application
- the nutrients already present in the soil (as shown by the analyses)
- the removal of clippings

When clippings are left on turf, like on most fairways, they can provide a high amount of nutrients (especially when they are rapidly broken down) that must be evaluated over the years on the basis of soil analyses. For greens in particular, it is always preferable to use small amounts of fertilisers frequently (every 2-3 weeks) so as to make up for the nutrients consumed and to limit leaching hazards on sandy soils. Fairways do not require regular fertiliser inputs as this could change their botanical composition. Roughs do not need fertiliser applications.

Type of fertiliser

The range of fertilisers on the market is very wide. In general there are two main categories: fast-acting nitrogen fertilisers (nitrate or ammoniacal nitrogen) and slow-release fertilisers, organic or chemical (IBDU, UF, SCU). It is important to consider the extent to which they are water-soluble, because this is correlated to water-table pollution in case of overapplication. Table 9 and 10 report the main characteristics of the most commonly used fertilisers. The type of fertiliser used can have a major impact on turf disease tolerance. For example, higher potassium levels can increase a natural disease resistance of the turf.

For the purpose of fertiliser application, it is possible to adopt:

- a mixed strategy**, using a slow-release basic fertiliser together with fast-acting products, such as leaf or granular fertilisers (that are able to rapidly supply nutrients) in the peak vegetation period .

In particular conditions it is possible to use:

- only leaf fertilisation**, that provides minimum and readily available amounts of nutrients, with fast results and minimum losses due to leaching. The routine use of these products can lead to shallow roots, thus making turf more sensitive to stress.
- only slow-release fertilisation**, that consistently releases high amounts of nutrients for a long period of time. These products do not have an immediate effect, but their action continues over time, in case of sudden stresses (such as a fungal disease), they do not allow for a rapid vegetation recovery.

Compost

Compost, that is recycled organic material such as leaves, lawn clippings and manure, mixed with soil and/or sand, can be effectively used on golf courses, on fairways and roughs in particular. This is designed to supply nutrients and to improve the soil structure. Not perfectly decomposed compost can promote the development of weeds.

Monitoring

Golf course turf monitoring is performed for:

1. integrated pest management, in order to evaluate the pest population and identify the economic threshold for treatment
2. the environment, to evaluate the impact of the golf course operation

For integrated pest management, agronomic monitoring is conducted on the basis of the following schedule:

daily: quality of the cut

- soil humidity
- incidence of diseases and pests
- weekly:** soil temperature
 - presence of algae dry patches
- monthly:** examination of the soil profile
 - evaluation of thatch and soil compaction infiltration time
 - pH
 - check of the irrigation system
- annual:** complete soil analysis
 - check of drainage systems
 - evaluation of trees for shady areas and poor ventilation

It is possible to collect a lot of useful data with a small weather station located in the golf course and equipped with a rain gauge, hygrometer, maximum and minimum thermometer (connected to probes at 5 and 20 cm of depth and at turf level) and an anemometer. Greater care should be taken for the monitoring of greens and tees, since they are the highest-risk areas. All the evaluations have to be accurately recorded and stored, in order to create a «data bank»). Weather stations should be integral parts of any high quality irrigation system.

Integrated Pest Management

Integrated Pest Management (IPM) is a program that uses information about turfgrass pest problems and environmental conditions which may precipitate these problems, and integrates these with turfgrass cultural practices and pest control measures to prevent or control unacceptable levels of pest damage. It is a preventative approach incorporating a number of objectives including the following:

- 1) development of a healthy turf that can withstand pest pressure;
- 2) judicious and efficient use of chemicals;
- 3) enhancement of populations of natural, beneficial organisms; and
- 4) effective timing of handling pest problems at the most vulnerable stage, often resulting in reduced pesticide usage.

It is an ecologically based system that uses biological and chemical approaches to control.

Pesticides are a necessary and beneficial approach to turf pest problems, but use can be restricted in many cases to curative rather than preventive applications, and isolating problem areas for spot treatments can reduce environmental exposure. Pesticide selection should be based on a risk assessment approach that strives to use only pesticides that are based on effectiveness, not toxic to non-target species, that act quickly and degrade quickly, are less soluble and not persistent. Few pesticide applications are made on a regularly scheduled basis. The main exception is the use of pre-emergence herbicides. There should be little, or no need for such treatments in the Red Sea region.

Additionally, materials should be applied strictly in accordance with label instructions, at labeled rates, and preferably on a spot-treatment basis, either painted on or with a low-volume sprayer to reduce the possibility of drift. Materials should be rotated as to use when possible. This deters the development of resistant strains of pests which may require more frequent and/or higher rates of pesticide applications.

This approach includes six basic components as follows:

- 1) monitoring of potential pest populations and their environment;
- 2) determining pest injury levels and establishing treatment thresholds;
- 3) decision making, developing and integrating all biological, cultural, and chemical control strategies;
- 4) educating personnel on all biological and chemical control strategies;
- 5) timing and spot treatment utilizing either the chemical, biological or cultural methods; and
- 6) evaluating the results of treatment.

The natural characteristics of the turfgrasses limit movement of pesticides and fertilisers into underlying soils, surface water, and groundwater. Thatch produced by the turf acts as an organic filter to chemically bind pesticides. Producing a healthy turf, which is needed for a golf course, has the added benefit of immobilisation and microbial degradation of pesticides retained in the thatch layer. In addition, turfgrass root systems are quite extensive and fibrous, and are able to adsorb and absorb applied pesticides that might penetrate the canopy and thatch and reach the roots. Thus, a healthy turf results in effective nutrient and pesticide retention and control.

WASTE MANAGEMENT

One of the most obvious, visible problems along the Red Sea Coast, is litter. The roadsides and landscape are strewn with rubbish and piles of construction spoil. This is unsightly, unhealthy and creates a poor impression to visitors arriving in the area.

The golf courses cannot begin to tackle this wider destination problem, but at least within the TDC's more effort must be made to provide comprehensive waste sorting facilities. Providing there is a TDC level facility to receive different waste streams and to reuse, recycle and/or compost certain types of material, it will be very difficult for the golf courses to implement any meaningful waste management policy.

Irrespective of supporting infrastructure at TDC level, there are ways for golf courses to reduce waste generation. These will help reduce management costs, so are certainly worth implementing, even if the wider issues cannot be dealt with as effectively as one would wish. Potential measures could include:

- Installation of appropriate systems for filtering wash water
- Better calibration of machinery to improve working efficiency
- Recycling initiatives - club house and golf course
- Less wasteful equipment cleaning methods - e.g. compressed air and low pressure water hoses
- Use of natural materials (e.g. wood, stone...) found on site rather than buying in
- Set up compost system for grass clippings and other plant cuttings and recycle as mulch in landscaping areas
- Hazardous waste protocol:
 - o maintain a register of all hazardous products kept on the site
 - o store, apply and dispose of hazardous products in accordance with legal requirements and label instructionsIn addition, the management programme should include provision for measuring waste production, so that one can monitor progress. Specific measures include:
 - Solid waste production - quantify total amounts of solid waste generated per annum
 - Hazardous waste production - quantify total amounts of hazardous waste generated per annum

ENERGY EFFICIENCY

Energy efficiency is a category which involves the whole club operation - golf course, club house and ancillary facilities - yet it is generally poorly developed as a golf management concern. There are considerable potential cost savings to be made in this area, so the first stage must be to review current energy consumption patterns and then to introduce specific energy conservation measures. A consequence of reducing energy and fuel consumption will be a reduction of noxious emissions. The environmental effects of one's activities can also be further improved through introducing an environmental procurement policy.

The recommended measures combine quantitative checks on performance and practical actions to reduce energy use and emissions.

- Carry out a review of energy saving potential throughout the club - identify principal energy consuming activities: e.g. golf course irrigation, operation of maintenance equipment, heating/air conditioning and refrigeration.
- Calculate total energy consumption per annum
- Calculate total fossil fuel consumption per annum
- Calculate total amount of lubricants and hydraulic oils consumed per annum
- Use electric rather than petrol powered buggies
- Introduce low energy lighting systems
- Improve insulation, heating efficiency, ventilation, equipment use
- Convert cooling/air conditioning systems to avoid use of CFCs or HCFHs
- Switch to cleaner fuels and energy sources where available
- Investigate potential grants for installing renewable energy supply units - wind and/or solar
- Policy to apply a `green filter' to all purchasing decisions, testing:
 - whether product/supply is locally available pollution risk
 - necessity of purchase in first place availability of spare parts

 - performance quality packaging

 - durability disposabilit
 - energy efficiency noise of operation
 - potential for reuse and recycling
- Communicate policy to suppliers and encourage them to adopt similar policies.

EDUCATION AND THE WORKING ENVIRONMENT

One of the particular difficulties in a country where golf is a relatively new and small scale activity, is to recruit qualified labour. The present model is generally to hire expatriate Superintendents, a couple of qualified nationals with technical knowledge/experience in engineering, agriculture/horticulture, and then large numbers of unqualified local labourers.

This is the most realistic approach, given the difficulty and cost of obtaining top grade greenkeeping equipment, and the low cost of manual labour in the region. However, golf course management is a complex operation, especially in such extreme environments, where simple mistakes can have significant consequences.

Therefore, there should be a premium placed on providing frequent on-the-job training for all staff. This will be especially cost-effective if the working conditions are sufficiently attractive, so that labourer turnover is reduced.

Education and training are continual processes. The results may be less visible than in other categories but will be vital to underpinning the overall programme. Specific measures to be targeted could include some of the following.

- o Keep a staff training log - hours per person per annum
- o Increase expenditure on training as a proportion of total turnover
- o Increase/extend staff training provision - hours per person per annum
- o Monitor number of qualifications/awards gained by employees
- o carry out an education audit for each of the technical management categories to ensure staff have a broad understanding of the programme
- o Improve signage warning of risks, marking safe routes, sources of help...
Schedule upgrades to maintenance workplace facilities

Superintendents on Egyptian golf courses live in rather isolated conditions. This is an inevitable consequence of geographical separation and the small size of the industry, both nationally and across North Africa and the Middle East.

As part of the wider sustainable tourism initiative. RSSTI should aim to facilitate a regular exchange forum for golf course Superintendents. This would be a precursor to establishing a genuine national greenkeepers' association, when numbers reach a viable level. Additional support services from external experts in particular disciplines would be very valuable, and could also form part of a continual professional development programme coordinated via RSSTI.

COMMUNICATING ENVIRONMENTAL AWARENESS

There is increasing emphasis in the tourism sector to inform visitors more about the local environment of their destination. This adds an element of interest, and can also be used as part of the destination marketing.

In the case of Red Sea Coast golf courses, there are many obvious environment-related questions to address. Many visitors will be curious about how a quality golf course is maintained in such a desert environment, and they will be interested in the way that the golf courses attract many migrant bird species.

It would therefore be a good exercise to provide information to explain more about the local conditions, the wildlife of the area and how the golf course management takes account of environmental conditions. If done well, such information will give visitors a better appreciation of the resort.

This is especially important since many of the visitors to the region come from European countries, where environmental awareness is high on the public agenda. It is important, however, that the information is presented in a credible, factual way, not as some promotional stunt that does not bear out with the reality of visitors' experiences at the resorts.

Potential measures to implement include:

- o Green corner' or 'eco-table' in club house and or hotels
- o Poster and/or leaflet featuring the wildlife of the site and/or the environmental programme in general
- o Interpretative boards on site
- o Establishing a walking trail around the golf course with explanatory leaflet and guide to plant species and birds
- o Press releases/articles published in national and international and trade press
- o Web site with environmental section
- o Exchanges with other resorts

ENVIRONMENTAL MANAGEMENT PLANNING

All the good practice tips in the world are little use without a structure with which to develop a properly integrated golf course management programme. The basis for effective environmental management of golf courses is built around the concept of Environmental Management Systems. These are well established tools enabling companies and organisations to develop appropriate policies, procedures and measures to integrate environmental considerations into their day-to-day operational management. When implemented properly, an EMS can be a very cost-effective contribution to the running of a business or organisation.

The Committed to Green system, developed by the European Golf Association Ecology Unit is a golf specific Environmental Management Programme. It was based on the same structure as official international systems such as EMAS and ISO14001, but was tailored to the particular circumstances of golf courses. Committed to Green is more than just a management system, it provides for measurable improvements in environmental performance. It has the following attributes:

- o Voluntary participation
- o Commitment to continual improvement of environmental performance
- o Independent verification
- o Public reporting of results

Although developed within a European context, Committed to Green is perfectly adaptable to golf courses in other parts of the world. This is, therefore, a suitable model for the Red Sea golf courses, something which could be used throughout the Egyptian golf sector.

The goals are simple:

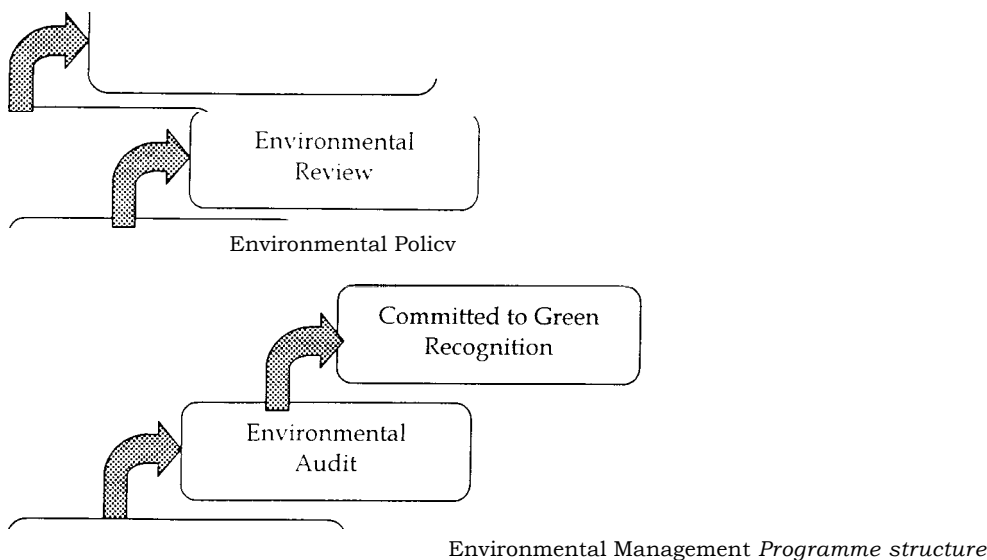
- o To encourage all Red Sea golf courses to adopt an Environmental Management System approach
- o To achieve a measurable improvement in their environmental performance
- o To be able to monitor the long-term sustainability of Red Sea golf courses
- o To encourage all Red Sea golf resorts to achieve certification by a competent body and to report publicly on their achievements

An EMS does not automatically imply that an organisation is good for the environment but it does mean that the organisation is actively aware of the issues and with a fully functional system it has the capacity to improve its environmental performance. Certification goes one step further and allows for performance benchmarking as a measure of progress.

The following guidelines set out how Red Sea, or other Egyptian golf courses, can adopt the Committed to Green approach and render themselves eligible for accreditation under this programme. This approach is increasingly popular in the competitive tourism market. It is especially important for new destinations to find any extra angle with which to distinguish themselves. Often, a considerable part of the appeal of a destination is its setting; i.e. its environmental situation. To be able to feature this and to demonstrate that the environmental quality is a special concern of the resort managers, will be a positive selling point, as well as a good management choice in the first place.

Setting up an Environmental Management System

The structure of the Committed to Green programme is built on five basic steps



Environmental Policy

In EMAS and ISO 14001 the first stage is to carry out the environmental review. However, in the case of golf clubs it is best to start first with a statement of commitment: i.e. the Environmental Policy. It is important first of all that the club management and membership are supportive of the initiative and have the chance to be involved in the process. Not only will the policy set out some key principles regarding environmental responsibility but it also provides the opportunity to establish a 'Green Team' within the organisation.

Few golf clubs have the resources to engage professional consultants or in house environmental specialists. Therefore they need to build a team from within - also drawing in external help if possible - and the policy statement gives that team the mandate to carry out a thorough environmental review.

This simple first step is psychologically important: it provides an 'early win' which can be seen by all stakeholders and forms the basis for future steps. The policy should of course be reviewed periodically.

The specific content of the environmental policy should include at least a commitment

- to continuous improvement;
- to compliance with relevant regulations;
- to minimise the impact on the environment of all activities within the golf course conforming the most up to date Best Management Practices;
- to minimise resource consumption;

- to provide appropriate environmental training for all employees;
- to improve communication with employees, members and stakeholders in general;
- to periodically monitoring of the environmental performance, -
- to increase environmental awareness among the users of the golf course..

Environmental review

This provides the baseline picture of the current environmental performance of a golf facility. It should serve as a 'gap analysis' enabling the club's Green Team to identify priority issues, areas of deficiency and opportunities for improvement. The results of the review will determine how the Environmental Management Programme is defined and implemented.

The specific technical categories to be addressed by golf clubs in this system should be:

- o Environmental management planning
- o Communications and public awareness

- o Education and the working environment

- o Nature conservation

- o Landscape and cultural heritage

- o Water resource management

- o Turfgrass management (pollution control)

- o Waste management

- o Energy efficiency and purchasing policies

These are not ranked in any order of priority. To complete a full Environmental Management System will mean a fully integrated approach to each of these component parts. Ultimately there is much overlap between the categories and these divisions are essentially labels of convenience for defining the structure of the programme.

Environmental Management Programme

This is the specific action plan for carrying out environmental management within the golf course operation. It should embrace:

- Specific technical measures to improve environmental performance
- Priorities, targets and timescales
- Responsibilities

- Monitoring, recording and reporting systems

Audit

There should be a regular process of internal review and progress checking. This is essential in order to get the best value out of the programme and to understand how well the system is working. The audit process provides a closed-loop feedback to the policy, review and management programme steps.

Beyond this internal exercise is the question of independent audit by an external verifier. This only becomes necessary if the club/organisation is seeking to gain certification under whichever scheme it is following.

Certification

This is the formal accreditation procedure by which clubs/organisations may achieve public recognition for their environmental achievements.

How to achieve Committed to Green Recognition

To attain full Committed to Green recognition, applicant clubs must submit an *Environmental Statement*. This summarises the Environmental Management Programme in a standardised format, based on three principal levels:

- i. Basic requirements: These provide both a qualitative and quantitative checklist of essential environmental management data across each category. They also establish a baseline of environmental performance against which future progress can be assessed.
- ii. Description of achievements: A statement of actions undertaken. This provides scope for describing many different and innovative measures, which will draw out your understanding, commitment and enthusiasm. The aim is to reinforce the basic requirements to gain a sense that you are really making a difference in key areas and thinking about environmental stewardship beyond mere compliance with minimum specifications.
- iii. Future targets: Specific goals for the next review period - i.e. over 3 years. Wherever possible these should comprise distinct, measurable aims, backed with specific actions with which to achieve the targets.

A good Environmental Statement will be much more than a simple checklist of actions and measurements. It should convey a clear sense that you have achieved the following:

- o An understanding of how golf course management activities relate to the environment
- o Identification of priority environmental protection and/or management issues

- o Undertaken a range of relevant practical measures across each category

- o Evaluated results and benefits - to the environment, the club and the local community
- o Identified appropriate future actions within a given timeframe

Committed to Green aims to reward those who demonstrate a considered approach to management appropriate to their circumstances. It is not based on rigid and costly standards that only the larger facilities could achieve.

Verification

Committed to Green recognition is subject to external verification, as it is important to provide a high level of public confidence that the achievements claimed really have been made. This is a crucial part of ensuring the credibility of the programme, so that the effort you have made is genuinely recognised and worthwhile. This applies to all applicants seeking full recognition.

Verification should be undertaken by a qualified expert, or team of specialists, who understand environmental management, the regional environmental conditions and golf course issues. The RSSTI should establish a panel of such experts to oversee the programme at a national level. This would be the most effective way of operating the system in the long-term.

Alternatively, in the initial stages of developing a Committed to Green approach in Egypt, and given the small number of existing golf courses, the verification could be done by external experts. This would be costly but could be made more cost-effective if combined with training for the future National Expert Panel members and local verifiers. Eventually the national programme would be responsible for ensuring the appropriate standards and verification.

International Advisory Commission

The Committed to Green Foundation is the body responsible for issuing Committed to Green Recognition. It will do so based on the Environmental Statements and supporting submissions (verification reports) via the National Expert Panels. In addition, from time to time the Foundation may refer to its International Advisory Commission (IAC).

The IAC will not duplicate the work of the National Expert Panel. It serves as an independent advisory commission to the Committed to Green Foundation. It provides technical and strategic guidance to reinforce the credibility of the programme and to ensure a reasonable balance of standards across the different participating countries.

The Advisory Commission comprises experts in golf course management, turfgrass science, environmental management and other disciplines as required. There are also representatives from international public bodies such as the European Commission and United Nations Environment Programme.

The award

Once it is satisfied that all conditions of application have been met, the Committed to Green Foundation or its national counterparts will confirm the award of recognition in writing, together with a Certificate of Environmental Excellence.

The terms and conditions of Committed to Green recognition are as follows:

- a Recognition is valid for three years from the date of the award as specified on the certificate.
- o Recognised clubs are entitled to use the Committed to Green logo on materials and promotions related specifically to the site that has been recognised. The logo cannot be used on commercial merchandise.
Notification of each award will be announced on www.committedtogreen.org together with summary information and links to national project web sites and the individual club web sites as applicable.

The Environmental Statement must be made publicly available.

An annual summary report will be issued by the Committed to Green Foundation, detailing all the awards made during the year. In addition, national batches of awards may be announced at different times to coincide with particular events likely to attract most publicity.

N.B. The Committed to Green label is only awarded to the specific sites that have successfully completed the full recognition process. If, for example, your organisation operates more than one golf property, separate recognition must be obtained for each individual site.

Renewal

After three years all fully recognised clubs need to reapply to renew their recognition. This will require an updated Environmental Statement, highlighting changes and progress over the intervening three years. Again it will be verified as in the original application.