GOLF COURSE 2030

FRANCE

R&A

ffgolf

An industry roadmap addressing challenges from, and taking opportunities presented by, the changing climate, resource constraints and regulation to secure optimal golf course condition and playability for current and future generations.

GOLF COURSE 2030 was initiated by The R&A in 2018. The R&A governs the sport of golf worldwide, outside of the USA and Mexico, on behalf of over 36 million golfers in 143 countries and with the consent of 156 organisations from amateur and professional golf. The R&A is committed to investing in developing golf and supports the growth of the sport internationally, including the development and management of sustainable golf facilities. The R&A continues to lead the Golf Course 2030 initiative, supporting stakeholders to develop the initiative in their own country or region and investing in research, education and other activities to prepare the sport for what may be challenging times ahead.

The main objective of **GOLF COURSE 2030** is for industry stakeholders to agree on **a roadmap that secures optimal golf course condition and playability for current and future generations** by addressing challenges from, and taking opportunities presented by, the changing climate, resource constraints and regulation. The roadmap needs to meet strategic needs at regional, national and local level, and the operational needs at golf facility level.

The remit for GOLF COURSE 2030 is the condition and playability of the main in-play areas on the golf course, from tee to green, including fairways, bunkers, green approaches and surrounds, and the primary rough. However, the roadmap will also need to highlight any impact of outcomes on biodiversity, the local community and the multi-functional capacity of the green space.

GOLF COURSE 2030 seeks to **bring the golf industry** together to clearly identify the challenges and opportunities facing those developing, designing, building and managing golf courses with regards to the changing climate, increasing resource constraints, and the regulations agenda.

GOLF COURSE 2030 centres on a range of realistic scenarios, from business as usual to, effectively, a doomsday prediction of disruption from extreme weather, water scarcity, high resource costs and limited chemical availability.
In this challenging environment it is impossible to see how we can maintain the playing conditions we enjoy today without technological breakthroughs, and changes in attitudes and behaviours amongst many of the sport's stakeholders, including golf club owners, golfers, managers and greenstaff.

In addition to the production of the roadmap, **GOLF COURSE 2030** aims to :
- prepare the sport for what may be difficult times ahead,
- help ensure that current strategies and solutions are effective,
- uncover new solutions which can mitigate some of the challenges,
- make the most of opportunities that arise to enhance course condition and playability.

THE PROCESS FOR ACHIEVING THE OBJECTIVE

GOLF COURSE 2030 WILL BRING STAKEHOLDERS TOGETHER TO:

RAISE awareness of the potential impact of the challenges and opportunities on course condition and playability,

AGREE priority issues within a region or country,

UNDERTAKE analysis of current strengths and weaknesses in knowledge and understanding; practitioner education; tools for information dissemination, club engagement, knowledge sharing, tracking of progress, consumer awareness and external relations,

DEVISE and implement forward plans across key areas of strategy,

REVIEW progress on agreed priorities and goals, and once successfully addressed, move on to other issues,

ENGAGE with decision makers at golf facilities to ensure that proposed solutions are implemented,

HIGHLIGHT the key role to be played by course management staff in delivering an optimal standard of golf course condition and playability.

In this way, **GOLF COURSE 2030** will build upon and guide the future development of existing industry solutions and association initiatives, including those that:

- **disseminate** engaging messages and raise awareness,
- **engage** and **support clubs** through the provision of best practices, analytical tools, golfer engagement materials and recording of key performance data,
- **enable** credible reporting of evidence of industry best practice and industry progress,
- **facilitate** knowledge sharing,
- **recognise** credible leadership activity in course management.

WHAT IS OPTIMAL COURSE CONDITION AND PLAYABILITY?

Optimal course condition and playability is a subjective and variable term. It reflects the potential for any golf course to provide year-round access to firm playing surfaces which are fit for purpose. The potential of any course will be limited by many factors.

Optimal condition and playability could be considered as:

Optimal course condition and playability
=
Potential x [Site conditions + Design + Construction
+ Ressources (machinery, manpower, materials) + Quality of Decision-Makers/Management
+ Weather + Golf Objective + Amount of golf/maintenance traffic
+ Revenue + Regulation]]

The Golf Objective in this equation reflects the target market of the course and this can range from Championship standard (challenging), through Recreational standard (appealing to all golf handicaps), to Beginner standard (introductory level to the sport, with limited challenge), or any combination of these standards.

Optimal performance delivers the potential of a course for as much of the year as possible and as consistently as possible. The optimal performance in terms of the condition and playability of any golf course will vary through fluctuations of the limiting factors, e.g. seasonal weather. Different types of courses will be more or less prone to some of the fluctuations, e.g. thanks to their natural drainage qualities, links will tend to retain greater consistency in terms of optimal performance than will parkland through periods of wetter weather.

DRIVERS FOR ADAPTATION

1 Climate

Changes in the climate and more climatic extremes cause problems for course managers. Turf does best in an environment with limited variability, and changes in weather patterns will result in the need for course management to adjust to such circumstances.

Climate predictions for France suggest that there will be changes to our weather patterns such as:

- An increase in the frequency of hotter and drier summers resulting in greater tensions for the sharing of the water resource between the different uses.
- The increase in temperature favours the development of invasive warm season grasses and weeds associated with the south of France. This dynamic is spreading rapidly north and affects the quality and the composition of turf as well as the playability of the golf courses.
- The increase in frequency and intensity of extreme weather events disrupting or impacting the management of golf facilities (storms, floods, soil erosion, etc.)

2 Ressources

The resources considered essential for today's golf course are likely to become scarcer and cost more. This applies to water, pesticides, fertilisers, sand, energy, labour, etc. Resource use on the golf course varies dependent on the type of course, e.g. links or parkland, and on the intensity of management related to the area of the course being treated.

The golf facility contributes to health/ well-being, and biodiversity.

A golf hole (see image to left) is made up of a number of different areas, which tend to receive different levels of treatment.

1 **The greens** (1 on image) are the most intensively managed part of the golf course, yet only take up around 1 hectare of the 60 hectares of an average 18-hole golf course.

2 **Fairways** are less intensively managed but cover around 16 hectares, so any single input will amount to a greater quantity than a similar application to greens.

3 **The teeing grounds** and **green approach/ surround** 4 are each of a similar area as the greens and generally receive an intermediate level of management between that of the greens and that of the fairways.

5 **The bunkers** are a sand-filled hazard, whose number can vary on any individual golf hole.

6 **The maintained rough** receives very limited management, mainly mowing.

Up to 50% of the area of a golf course can be natural habitat, providing a haven for wildlife.

3 Regulation

Legislation in France will need to be considered when assessing impacts on course condition, playability and cost and in devising potential solutions to regulation-led limiting factors.

The main legislation likely to have an impact on the condition and playability of golf courses have been transposed from the European Union Directives on water(1) and the sustainable use of pesticides(2). The French government may decide to go further than the initial ambition of these Directives and regulate more severely the use of water and pesticides for golf courses.

There is a framework agreement between the French Government bodies and the golf industry aimed at maintaining a framework for consultation with regard to the development of recognised projects of common interest relating to sustainable management of water resources, gradual reduction of the impact on the resource of withdrawals for watering golf courses, reduction in the use of plant protection products and preservation of biodiversity. This charter was renewed in 2019(3) until 2024 and follows on previous ones signed in 2006 and 2010. This new agreement encourages the continuation, perpetuation and extension of reciprocal commitments to guarantee the conditions for thesustainabile development of golf in France.

GOLF COURSE 2030 also has to take a global perspective and its objectives are aligned with the UN's 2030 Agenda for Sustainable Development1.
The United Nations Sustainable Development Goals (UN SDGs) provide a valuable reference and golf can contribute directly to the following goals:

Clean Water and Sanitation
Water quality and pollution prevention.

Affordable and Clean Energy
Transition to cleaner and their renewable energy.

Industry Innovation and Infrastructure
Innovation to mitigate against challenges.challenges.

Responsible Consumption and Production
Safe and responsible use of resources.

Climate Action
Adaptation, ecosystem services and carbon sequestration.

Life Below Water
Protection of water bodies and wildlife, pollution prevention.

Life on Land
Habitat protection, enhancement of biodiversity and pollution prevention.

Partnerships for the Goals
The industry working together so it is speaking with one voice, to ensure that there is commonality of language and messaging.

(1) Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

(2) Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides

(3) Accord-cadre golf et environnement 2019-2024

(4) Transforming our world: the 2030 Agenda for Sustainable Development

FUTURE SCENARIOS

To produce a roadmap that secures optimal golf course condition and playability for current and future generations, there needs to be a consideration of what might be. The drivers for adaption pose many potential scenarios.

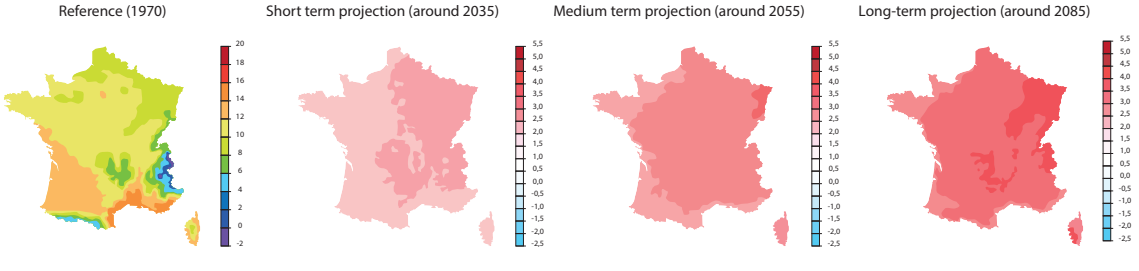
Presented here are three 2030 scenarios, from business as usual to a potential doomsday prediction of extreme weather, water scarcity, high resource costs and no chemical availability.*

Scenario 1

Limited change from the environment that now exists as alternative technologies, management solutions and behavioural change address the challenges posed by climate, resources and regulations and optimal golf course condition and playability is secured.

Course condition and playability is comparable to that available today. Drivers for change are weak and opportunities to enhance the potential of golf courses, their performance and environment will not be realised. There could be extra costs for golf businesses that position themselves as early adopters of new technologies, which may be passed on to the customer, so golf could be more expensive.

CERFACS/SCRATCH08 - France CNRM : modèle Arpege-V4.6 étiré de Météo-France



* These scenarios should be related to the current optimal performance of golf courses. It should also be borne in mind that there is a sliding scale between the two extremes cited in scenarios 1 and 3.

Scenario 2

Severe restrictions in the availability and use of synthetic chemical plant protection products, together with 50% less water being available for irrigation compared with current levels. Alternative technologies, management solutions and behavioural change partially address the challenges posed by climate, resources and regulations.

More months of the year will see greater course closure due to extreme weather events, notably flooding, and more damage and scarring to turf from water and pesticide restrictions, related to hotter summers and wetter winters.

The condition and presentation of surfaces will see periodic troughs, with golfers having to accept a different style of golf and course performance, notably in terms of reduced green speed. There is also the prospect that course condition will improve as turf naturally adapts and firmer surfaces become the norm. Golfers will appreciate and enjoy the seasonal change in course appearance and playability.

There will be increasing pressure on golf facilities to survive as the cost of maintenance increases. This will lead to opportunities for a greater flexibility in course design, e.g. fewer holes, less maintained turf, and an increase in diversification to provide multi-functional green space.

Golf businesses will need to spend more on new technologies and more expensive resources to sustain course condition and playability. Golf will be more expensive to play. Golf facilities will also see a decline in income as deteriorating conditions reduce the attractiveness of the sport, though those that embrace the opportunities for a different type of golf and diversification of land use will thrive.

There will be some course closures, notably those wholly reliant on water and synthetic chemical plant protection products to keep a grass cover, and this will impact on the contribution of golf to the local, regional and national economy.

Scenario 3

The banning of all chemical plant protection products and fertilisers, together with 75% less water being available for irrigation compared with current levels. Alternative technologies, management solutions and behavioural change fail to address the challenges posed by climate, resources and regulations.

There will be longer periods of course closure, damage from extreme weather events and disease/pest/weed incidence and the high cost of resources results in loss of customers and permanent closure of many facilities. There are serious consequences for the contribution from golf to the local, regional and national economy.

The combination of hotter summers and less water being available means that only those with sustainable sources of water for irrigation can retain a reasonable cover of grass. Only those that can afford course renovation, a secure water supply and significant levels of extra labour or automation of certain maintenance practices will be able to cope with these pressures and, even in such situations, golf will be regularly played on inferior surfaces compared to what we enjoy today. The use of artificial turf increases for those that can afford it as the problems in managing natural turf become insurmountable.

GAPS, STRENGTHS AND WEAKNESSES ANALYSIS

Preparing for the future means, thinking of how to face challenges and opportunities and think about the perception and enjoyment of golf game today.
In order to conserve today's playing surfaces and anticipate the adaptation to climate change, resource scarcity and regulations we need, to analyse our knowledge lacunas, list our strengths and weaknesses in our approach and consequently identify remedies.

Such a process has to include the assessment of different scenarios over the next 50 years. In that respect, lacunas' analysis will lead us to a priorities' roster in order to determine solutions.
Designed solutions may include, best known practices, technological innovation, ecological adaptation, stakeholders' behavioural approach, social behavioural changes, research, communication, education...

Our strengths and weaknesses analysis can enlighten the industry and put into perspective: innovation paths, research, behavioural change and education but also permanent development paths of supporting programs for clubs, role and responsibility of all stakeholders.

The analysis focuses on 5 interdependent challenges :
1. The water preservation,
2. The sustainable golf courses maintenance,
3. The biodiversity conservation,
4. The waste management,
5. The reduction of carbon footprint.

1. WATER PRESERVATION CHALLENGE

All over the world, quality and quantity of water resource are every day increasingly under threat.
France is not an exception, with its limited existing water supply and wide range of uses (drinkable water, crops' irrigation, industrial use, leisure activities and many others). In addition, considering the water resource is unevenly spread over the country, a secure access is not guaranteed everywhere (over exploitation, increasing demand, pollutions...).

In France, the crispation over water resource is aggravated by climate change. While rain falls volumes remain constant, the occurrence is nevertheless more uncertain due to the alternation of long periods of drought and intense rain falls (thunderstorms and storms). The phenomenon leads to an every-days' decrease of ground water levels and compromises their reloading in a long run.

Thus, water restrictions are now quite common from one year to another, and even stricter for users, even over naturally and historically privileged territories. Those signals reflect an alarming dynamic which is absolutely critical to rally around.

We must collectively act both for the preservation of biodiversity we belong to and human activities. They two of them, depend on the correct management and a fair distribution of our water capital.

Water is an essential item for the golf game. As the matter of fact, the maintenance and preparation of a healthy turf and a valuable green cover, imply a water input that cannot completely be supplied by rain falls.

In France, more than 70% of golf courses' irrigation water comes from nature (underground and surface waters). By default, close to 10% of golf courses use drinkable water. These courses are highly dependent on climate evolution and resource availability and are directly affected by restriction measure. Such measures aim at sharing the resource between the different users in a spirit of solidarity, preserving the aquatic ecosystems and their biodiversity, giving the priority to the safeguarding of drinkable water for all.

Only 20% of golf courses can benefit from what can be considered as a durable water supply : collected and stored waterfalls, row waters from big irrigation canals, recycled water purification plants.

The golf sector has been strongly active since 2006 to address this issue, through the "Water charter" signed with the Ministry for Ecology and the Ministry for Sports. The charter's engagements aim at evaluating golf courses' impact and priority actions to launch in order to reduce that impact. Such a consultation framework, between the state and the golf industry, enables the establishment of progressive and adapted water-use limitation measures, in the event of water-use restriction decrees edition. At the first level (alert threshold), the irrigation is forbidden during the day. At the second step (seizure threshold) fairways must not be irrigated and in case of serious crisis (strengthened threshold), tees irrigation is forbidden too. Greens surfaces (equivalent to 10% of a golf course average surface), irrigation is still permitted to ensure the economic activity of golf facilities. In case of drinkable water shortage, greens irrigation can be banned.

In return of these safety arrangements and successive agreements signed with Ministries (renewed in 2019 until 2024), the golf industry has committed to:

- pursue water consumption reduction (renovation and optimization of irrigation networks)
- implementation of agronomic solutions (flora conversion to set up water lack resistant seeds, increase of mechanical operations to improve the soil's capacity to stock water and enhance turf deep rooting)
- seek for and implement, as far as possible, alternative process to avoid natural or drinkable waters withdrawal: creation of storm water collection systems, utilisation of water treatment plants resource.

Considering 80% of golf courses are potentially impacted by restriction measures, it is not unusual to see dry and yellowed fairways in summertime.

Such a phenomenon can be induced by the publication of a decree but also by the decision of golf clubs. More and more facilities voluntarily decided to restrict the irrigation of fairways to reduce their impact on the resource (the fairways irrigation usually represents 60% of the total volume of water consumption). Whether it is suffered or assumed, the dried and yellowed status is temporary. These changing conditions can be confusing for golf players. The implementation of raising awareness actions is then necessary to make them understood and appreciate the meaning of such water efficiency and solidarity measures. We must keep in mind that the whole essence of the golf game is to learn about changing conditions, to develop our adaptation and decision skills on the course :

- clubs selection,
- trajectory choice,
- security or risk taking,
- rolled hit,
- shorter attack to reach the flag,...

2. THE CHALLENGES LINKED TO A SUSTAINABLE MAINTENANCE

The principle of turf preparation is to get a homogenous and dense cover composed of seeds adapted to the location, the climate, the ground and the different playing surfaces constraints. The turf must be in capacity to regenerate and resist to the different mowing and mechanical maintenance operations.
Nevertheless, the various physicochemical and agronomic features of the ground degrade with time. The repeated circulation of machines induces soil compaction and strangling, thus advantaging deficiencies like diseases and unwanted species.
Preventive measures such as aeration, scarification, top-dressing: provide a turf deep rooting process, improve the drainage, optimize the inter-relationship between air and water and turf access to nutriments and soils life. All these improvements stimulate natural turf defences, against mowing and trampling stress.

Despite aforesaid preventive maintenance operations, the pressure of harmful organisms on turf (exacerbated by climatic variations and climate change in general) can quickly jeopardize playing surfaces getting them impracticable.
Before reaching this irreversible status, remedial actions can be taken at tipping points, through the use of organic and chemical phytosanitary products.

The economical balance of golf facilities and indirect economies (tourism, accommodation, F&B, equipment manufacturers, suppliers and services providers,....) mainly rely on the preservation of a year-round playability quality.

For several years, huge efforts have been undertaken by the industry to prevent the appearance and development of unwanted organisms: improvement of the knowledge with the implementation of an epidemiological surveillance network about harmful organisms, the evolution of cultural practices to reduce chemicals, technological progress, investments in equipment and staff, training modules…

The burgeoning of alternative solutions such as natural lower concern preparations (NLCP) biocontrol, biological control… and the progress in the selection of seeds varieties, open up promising perspectives to repel the utilisation of chemicals and pursue the reduction of their usage their usage restriction

Even though the use of biologic alternative solutions is rising, it remains marginal.

First of all because alternative solutions do not provide a proper answer to each encountered challenge. Their implementation is complex inducing an irregular and limited efficiency (up to 70% maximum, according to Ecoumène Institute tests).

Generally speaking, these solutions are more expensive than currently available solutions and few of them go through the marketing authorization process validating their efficiency.

Let's underline that even natural options can have negative impacts on the environment.

Taking into account the present level of knowledge, a drastic banning of chemical use would consequently rush super-intendants to non-validated and non-experimentally framed alternative solutions.

That would lead to: - a technical incapacity to quickly adapt and answer the essential quality requirements bond to the golf game, - a dramatic deterioration of the playing conditions – -a lack of interest or a deep change in golf players and public behaviours during professional competitions- a major cripple in a context of international competition – a heavy economic impact specifically on the most vulnerable golf facilities – a trend to synthetical turf use, which carbon foot print and life cycle are moot points.

Let's underline that, these types of surfaces need preventive maintenance operations against, mosses development, weeds and pathogens. This may lead to the use of weedkillers, defoamers, biocide treatments and thus to potential health risks for players – a temptation to divert from the proper use of alternative solutions and the creation of a parallel market.

Since the implementation of the "Ecophyto Plan" in 2008, a national survey conducted by the FGF and issued in 2017 showed **the initial target, reduction of more than 50% the use of chemical phytosanitary products,** had been over achieved thanks to a cut of maintained surfaces and by lowering applications frequency.

In spite of these efforts, chemicals remain as off today, the sole efficient defence to avoid the above-mentioned disastrous consequences.

From a regulatory point of view, golf courses belong to "non agricultural areas" known as JEVI into the Ecophyto 2 plan (gardens, green areas and infrastructures). The use of chemicals is regulated on these areas in a different way than on agricultural zones.

Although the "Labbé" Law from 2019 has banned the use of phytosanitary products on JEVI, sports turf (golf, football, rugby, horse races, etc…) are considered as "areas with specific constraints" and as such, have retained the possibility to use chemicals.

The quantity of active substances used on sports turf represents 0,02% of the overall annual quantity in France and is regulated in accordance with existing laws:

- Decree of May the 4th 2017 about the marketing and the use of plant protection products and adjuvants,
- Decree of May the 31st 2011 setting out the conditions under which plant protection products can be spread in the presence of high-risk public,
- Decree of August 29th 2016 ¬ about the individual purchase certificate and use of plant protection products.

In that context, societal expectations and political willpower are increasingly pressing sports facilities to ban the use of chemicals, in response to the various sanitary scandals linked to their impact on human health and biodiversity.
As a matter of fact, the pressure for the prohibition of these products is actually growing.
Yet the pesticides' use on sports turf is very restricted by the law and only trained professionals are allowed to apply them. They represent a minor proportion of quantities yearly used in France, knowing that the toxicological profile of their authorised active components guarantees the security of those applying and players, (no carcinogenic, mutagenic, reprotoxic and "very dangerous" products).

3. THE BIODIVERSITY PRESERVATION CHALLENGES

Nature preservation has become a fundamental necessity to limit and stop biodiversity erosion. Nevertheless, this target cannot be reached without the implementation of sustainable actions. Biodiversity covers the overall living organisms, from genes to ecosystems including the interactions bounding them together with the habitats they are living in. The abundance and diversity of species and habitats are vital to ensure a proper functioning of ecosystems providing our oxygen and feeding, in a nutshell our survival.
Biodiversity contributes to natural processes such as water cycle, soils fertilisation, floods and climate regulation.

Considering the French golf courses abundant but largely unknown biodiversity, the FGF committed to successive partnerships with the Natural national history museum, to boost its actions.
Born from the common willingness of the FGF and the NNHM, the pathbreaking "National study program for golf courses biodiversity" (NSPGB) was initiated in 2015. Thanks to the support of the overall French and European golf representative organisations, the program came through.

The objectives of the NPGB are:

- to build the broadest possible knowledge base about French golf courses biodiversity
- to get more insight into biodiversity challenges according to golf courses location
- to evaluate their global contribution and ecological interest in terms of natural patrimony conservation
- to support and make the managers accountable in order to reconcile biodiversity preservation and golf courses maintenance constraints.

To reach the target of the NSPGB, different tools were designed among which, the "Golf Program for Biodiversity" GPB. This program is based on the clubs' voluntary move to ensure, a continuous knowledge improvement regarding their natural patrimony thus ensure its conservation and valorisation. To get to the label stage, French clubs can rely on naturalist stakeholders, among which the well-known associative networks of the Birds Alliance, The natural areas Conservatory, France Nature Environment,...) or the public network (National Office for forests, Regional Natural Parks network,...) engineering offices, independent experts...

The naturalist structures' missions consist in, inventorying golf courses habitats and bio-indicators species and in assessing the functioning and the ecosystems' health, in recommending management and arrangement measures in order to enhance golf courses capacity to host biodiversity.

Such a labelling scheme is composed of three successive levels. Each level is based on specifications defined with the technical and scientific support of the Natural history museum of Paris. This tiered approach opens-up possibilities of monitoring the biodiversity's health over time and assessing the effects of management and arrangement measures in place.

Day after day, the intensity of human activities increases. We are now entering the sixth species extinction crisis with an extinction rate superior to the natural extinction one, from 100 to 1 000 times. One million animals and vegetal species (that is to say 1 out of 8) could become extinct soon.

Source: **wwf.fr**/rapport-planete-vivante.

HERE BELOW A SUMMARY OF THE GPB OBJECTIVES:

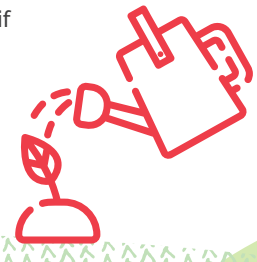
- **Bronze:** build a first knowledge data base about fauna and flora species hosted on the course,
- **Silver:** Intensify the knowledge and identify actions in favour of biodiversity
- **Gold:** implement and measure the effects of the actions in favour of biodiversity and share feedback with committed golf courses.

The labelling process will provide the NNPI (National Natural Patrimony Inventory) with a considerable amount of data about biodiversity on French golf courses, to be shared with the scientific community and a wider public.
The treatment of these data will contribute to an unprecedent study on golf courses' biodiversity at a country level.

Such a national in scope coverage, will enable the scientific community and golf world to enter into resonance. A wide commitment of numerous golf clubs will reinforce the scope of this innovative study and help clubs to act their own way with an objective tool. A good way to promote clubs' contribution to biodiversity preservation among the golf players community, naturalist stakeholders, local institutions, medias and wider public.

4. WASTE MANAGEMENT CHALLENGES

The intensive use of resources, wastes discharge to the environment and their bad management, heavily contribute to the decline of nature and our living areas impacting human health, living species and habitats. All ecosystems, sea and coasts ecosystems included, are dramatically affected by millions of tons of waste substances ending up in oceans and seas. The volume of produced wastes is inextricably linked to our consumption and production modes. Any non-recycled waste constitutes a wastage of raw material at all levels, from production to transport or consumption. A wastes mismanagement can also have direct and indirect consequences on human health, food production, tourism and generally speaking on economy and society.
Waste management requires a concerted effort of all stakeholders: consumers, manufacturers, hauliers, politicians, local authorities and obviously the waste management key actors. Consumers committed to recycle domestic waste can be efficient when a collection infrastructure is available. In parallel, communities can achieve an optimal recycling management only if consumers sort out their wastes.



To meet this challenge, the golf industry has to develop mechanisms to limit its wastes production, integrating recycling and valorisation industries, appealing to clubs, golf players and supplier's awareness.

WASTES ON GOLF COURSES MAINLY COME FROM :

1 Management activities

- Organic wastes, coming from courses maintenance: grass clippings,(mowing, leaves, pruning….) substrates.
- Packing wastes (plastics, papers, cardboard, glass and metals)
  Toxic wastes (chemical packaging, oils, solvents, cleaning products….)
- Maintenance equipment, end-of-life tools.

2 Golf players attendance rate

- Packaging wastes (plastics, papers, cardboard, glass and metals)
- Biodegradable organic wastes (food and catering)
- Sport equipment (mainly lost balls in natural areas)

Key indicators to evaluate the nature of wastes, their volume, destination and recycling-adapted process, must be developed to allow golf facilities to assess their impact and achieved progress in order to promote their accountable management.
Sports and leisure items manufacturers will soon be obliged to organise a recycling branch dedicated to their end-of-life goods (re-use, recycling) as part of the Manufacturer Enlarged Responsibility (MER) and the eco-contribution payable at the time of purchase.
The principle of the process is the prevention, the complete management of products life span and the implementation of the eco-design policy giving them a second life.

The measures impacting companies' activities will be: The compulsory consumers information about the environmental features of the products, the integration of the recycled raw materials, the products reworking obligation.

These obligations can create new opportunities, specifically for the golf industry as 32% of French players integrate the connexion to nature as a motivation for their sporting activities. Practising outdoors sports and acting for nature preservation must make sense for the sector professionals. Considering the FGF does not manufacture golf items, its role will be to encourage responsible purchases, to create collection points for used items and find outlets in terms of golf-goods recycling and valorisation.

FOCUS ON GREEN WASTES

Since 2011, green wastes have been classified as domestic wastes and burning them is forbidden. Green wastes generated on a golf course must not be considered as wastes as they can be treated and valorised in different ways. They can be dropped in rubbish dumps, or through collection networks to be **transformed into natural fertilizer** by composting or processed in **energy through methanization**. Golf courses shape and surfaces can allow green wastes composting such as grass clippings (greens and late mowing areas), pruning and dead leaves.

Green wastes can be reused as **paths mulch** after crushing, as **micro-habitats** for biodiversity (dead wood-bundles, hibernaculum,...) and as **compost** to produce breeding ground for courses. Nevertheless, it is paramount to select an appropriate composting zone to avoid any impact on the ground, underground waters or natural habitats and ensure a proper maintenance of the area (making sure it is always wet and oxygenated).

Mowing frequencies can be managed to avoid grass clippings collect. Remaining clippings on site (mulching on the fairways, roughs and tees) do not contribute to increasing moss. Such green wastes will be recycled by soil organisms and will provide additional **fertilisation** (no material exported nor nutriments).

5. CARBONE FOOTPRINT REDUCTION CHALLENGES

As off today, human activities escalation has an impact on climate warming.
In 2015 during Paris COP21, a climate and climate change universal agreement was signed by 195 countries. The core objective of the agreement is to keep the global temperature under 2 Celsius degrees through the massive reduction of greenhouse gases (GHG).
In France, greenhouse gases reduction is an issue that most industries, golf industry included, have to approach. That reduction can indeed be a source of savings in the medium and long term.

Within golf facilities, it is possible to tackle several greenhouse gases emissions: hybrid/electric maintenance machines versus diesel equipment, buildings heating and energy consumption, renewable energies, low consumption lightnings, energy consumption of irrigation systems...
In connection with the reduction of energy consumptions, it is possible to take an action on lightnings and more precisely exterior ones, to reduce or avoid luminous pollution (impact on fauna) and then contribute to the black corridor scheme (in particular in urban zones).
Golf facilities' purchase policy, can also integrate into its criterions the carbon footprint (low greenhouse gases emission, short channels...) Such a policy must seek for the systematic mutualisation of existing local resources and favouring local partners.
In order to achieve and valorise progress in terms of carbon foot print reduction, measurement tools must be developed and be available to evaluate on one hand the carbon foot print and on the other hand carbon capture.

Due to their natural environment and biomass ability, golf courses contribute to sequester CO2. This natural potential can be evaluated and optimised: selection of local species plantations with strong CO2 capture capacity, extensions of meadows areas...) to enhance, in the meantime, the hosting potential for biodiversity.

Golf courses attractiveness is an important source of greenhouse gases emission due to players transportation.
The mobility challenge, in order to find an alternative to the car, must be addressed (mass transport, car sharing, bicycle, charging station for electric cars, lockers for golf equipment).

Awareness raising measures and golf players education are equally essential, to favour and develop alternative and thrifty transportation means.
Promoting car-sharing means connecting individuals and thus dropping their environmental impact.

On the sports-events organisation topic and mainly international events, it is estimated that 90% of greenhouse gases emissions are caused by transportation. Wastes (plastic bottles, packing), water, energy consumptions, goodies distribution and catering, must be added to this negative evaluation.
The "15 Environmentally responsible commitments from event organisers" charter, developed by the Ministry for Sports, provides a frame to reduce competitions impact. The French golf Federation signed it for national and international competitions hosted at the Golf National (world amateur league team championship in 2022, Olympic games in 2024,...).
The FGF will raise awareness of clubs and events organisers for the integration of the charter into their specification note. Carbon compensation actions, could be launched to support general interest initiatives.

Thanks to the activation of the road map actions and the development of calculation tools to evaluate the golf industry carbon footprint, the reduction measurement will be thus meaningful.

ACTIONS PROCESS
GOLF COURSE 2030

In order to build an action plan, several steps of the road map are unescapable. The detailed process varies according to the nature of challenges and opportunities met by a country, a region or a facility. A cooperative effort of the industry as a whole, is paramount to go through each step of the process.

1

Join together stakeholders

Build a balanced group of people with a technical and strategical representation, focused on the sport long term interests to ensure the relevance of an initiative for a country or a region.

2

Identify priority issues

Stakeholders identify challenges and opportunities and agree upon priority issues to cope with over the 3 or next 5 years.

3

Actions plan to address priority issues

Raising awareness, communication campaigns, education, research and demonstration projects.

4

Actions plan execution

a progression period of 3 to 5 years is suggested, with a regular (annual) control to monitor progress, through performance key indicators.

5

Communication and education

Secure all stakeholders awareness regarding the action plan and monitoring process. Provide them with information and punctual communications to safeguard the ongoing commitment of the parties.

6

Reporting

Register further progress and success level in the resolution of priority issues. When issues have been sorted out, Go back to step 2.

For several years, the French golf industry has been perfectly in line with the actions process thanks to successive charters and the recent renewal of its master agreement **"Golf and Environment 2019-2024"** signed with the ecology, agriculture & food and sports Ministries
This master agreement focuses on three main challenges, the preservation of the water resource, the sustainable maintenance of golf courses and the biodiversity preservation.
Conscious of the importance of the environment preservation, the FGF has defined the three pillars of its priority actions for the future: **competitive sport, sporting activity development and the respect for the environment.**

The environment has got a central role in the federal actions plan.
On the FGF initiative, the industry met in 2019 to wonder about its future and the challenges linked to the major driving adaptation factors.
Stakeholders then defined the objectives in terms of playability and golf courses status enhancing the 3 priorities of the master agreement with 7 main strategic goals, in order to build a wide 10 year-action plan connected to the R&A Golf Course 2030 initiative.

THE 7 STRATEGIC OBJECTIVES

Biodiversity	**100% of golf courses committed to the "Golf Program for Biodiversity"**
Water	**Get courses independent of water use restriction measures**
Sustainable course	**A golf industry committed to R&D to achieve "zero phyto"**
Communication education	**Turn the perception of "polluting sport" into "eco-responsible health sport"**
Carbone footprint	**Assess, measure and reduce the carbon footprint**
Waste management	**Reduce wastes and optimise their treatment**
Economic model	**Conduct the 10-year action plan with the support of an endowment fund**

GOLF COURSE 2030
FRENCH **STAKEHOLDERS**

Industry stakeholders involved in the Golf course 2030 can be divided into support and basic groups

KEY STAKEHOLDERS

- French golf federation
- French golf courses managers association
- French greenkeepers' association
- European golf Association
- European Tour
- Golf contractors' group
- French associative golf courses
- Ecoumene Institute golf and environment
- PGA France
- R & A
- Golf chains : Bluegreen, Gaia concept, Open golf club, Ugolf.

SUPPORT STAKEHOLDERS

- Vidauban golf course corporate Foundation for the environment
- National natural history museum
- Agronomists and consultants
- Golf architects
- Golf industry suppliers
- Golf medias
- Sponsors
- Project leaders

Numerous sports federations are also committed to the golf course 2030 initiative (French football federation, Football League, French federation of rugby, rugby league, Hippodromes, the French Olympic committee), the government and national driving structures (Ministry for ecology, ministry for Food and Agriculture, Sports Ministry, Water Agency, the French Biodiversity Observatory…) non-governmental associations (environmental and naturalists associations), local communities, private companies and wider public, medias.

PRACTICAL ACTION

GUIDING PRINCIPLES FOR RESILIENT AND SUSTAINABLE GOLF COURSES

The main objective of Golf Course 2030 is the production of an industry roadmap that secures optimal golf course condition and playability for current and future generations by addressing challenges from, and taking opportunities presented by, the changing climate, resource constraints and regulation. There are, however, a number of fundamental, universal practical principles for golf course development and management which extend across the decision-making culture, agronomic practices, and broader considerations of golf's impact on and contribution to nature and local communities. The following is offered as a guide to those in decision-making positions.

1. **PLAN over the longer-term** and operate under consistent policies, which are documented.

2. **PREPARE for future challenges.** Consider the predicted impact of the changing climate (such as flooding, coastal erosion or drought), the availability and costs of vital resources and the constraints placed by regulation.

3. **RECOGNISE the professionalism of well qualified course managers and their staff.** They will play a vital role in securing optimal course condition and playability.

4. **SAFEGUARD the reputation and well-being of employees**, employers, golf facilities and the sport itself through strict compliance with the law. Decision makers at golf facilities must support their greenkeepers in adhering to this policy.

5. **CREATE the right environment** to produce healthy turf, which is fit for purpose, with adequate access to light and air, and good drainage and a biologically rich growing medium. Select and manage for grass species best adapted to local conditions.

6. **WATER scarcity** and cost are going to be increasing issues for golf. **Golf courses should be designed, built and managed to conserve water**, using the least required to produce healthy turf and firm playing surfaces. Where feasible, water for irrigation should be generated *in situ*, through recycling drainage, rainwater harvesting, irrigation reservoirs and other technologies. Where feasible, water derived from non-potable sources should provide the irrigation source. Grass selection should be targeted at species which are fit for purpose, but which require the least amount of irrigation water.

7. **THE TREND is for increasing pressure on pesticide availability and use.** It is likely that they will continue to be removed from use. Eliminate reliance on pesticides, identify and transition to alternative solutions to prevent and manage disease, pest and weed problems. Select and manage for grasses which are fit for purpose and which have the greatest natural resistance to disease infection, pest attack and weed ingress.

8. **FERTILISER** use is likely to be regulated as part of pollution prevention measures. **Select grasses which are fit for purpose with minimal nutritional input** and use products which offer the greatest protection to the environment.

9. **EXCESSIVE** organic matter accumulation creates weak turf, prone to stress and susceptible to disease infection, pest attack and weed ingress. **Management practices used to control organic matter accumulation**, e.g. various forms of scarification and top dressing, cause stress to turf. Select and manage for grasses which are fit for purpose, but which have a slow natural rate of organic matter accumulation and implement management practices, i.e. irrigation and fertiliser, responsibly in a manner which minimises organic matter build up.

10 **CUTTING HEIGHT** has a major influence on turf health and the requirement for maintenance, with over-close mowing inducing turf stress which requires greater water, fertiliser and pesticide inputs to correct. **Mowing heights should be implemented to sustain grasses which are fit for purpose,** but which are inherently healthy.

11 **ENERGY** derived from fossil fuels is going to become more expensive and **golf facilities should be transitioning to cleaner, renewable sources of energy.** Course design, construction and maintenance should be focused on energy efficiency, utilising grasses which are fit for purpose, but which require the least input of maintenance resource.

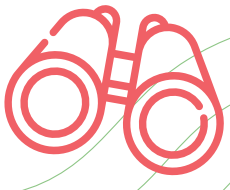
12 **DISPOSAL of waste** to landfill will become increasingly expensive and socially unacceptable. Course design, construction and maintenance should **focus on preventing waste and maximising reuse and recycling**.

13 **BIODIVERSITY** loss is a major global concern and golf courses have the potential to conserve and protect wildlife. Golf courses should be **designed and managed to provide quality habitat** for as wide a variety of native wildlife as possible.

14 **GOLF has a responsibility** to wider society and the design, construction and maintenance of facilities should **focus on making a positive contribution to local communities**, such as by providing a multi-functional venue for wider community integration and recreation.

15 **OBJECTIVE** assessment of the condition of playing surfaces, particularly the putting surfaces, on the golf course is required to monitor the impact of the challenges facing greenkeepers, the **implementation of research outcomes and adaptations in management.** This could include firmness, smoothness, trueness, reliability, speed, etc.

16 **THE RECORDING of key resource metrics** for course management, e.g. water, chemicals, energy, waste and biodiversity. Sustainability reporting on course operations is required on a facility, country, region and international level. This is necessary **to monitor the impact of the challenges** facing greenkeepers, the implementation of research outcomes, adaptations in management and compliance with regulations.



PRIORITIES
ISSUES AND ACTION PLAN

ACTING IN FAVOUR OF THE BIODIVERSITY PRESERVATION

The partnership initiated in 2015 between the French Golf Federation and the National Museum of Natural History has been renewed until 2023 in order to consolidate and extend the work initiated around the Golf Courses biodiversity study National Programme.
The implementation of these pioneering works at the level of each golf course is a priority objective and the "Golf for biodiversity programme" is the main tool to achieve it. If the more the Golf structures will get involved in this labelling scheme, the more golf clubs' contribution to the biodiversity preservation will be demonstrated. The positive perception of the activity will be then reinforced.

Several key developments must be set up to move towards this goal.

ORGANISING CLUBS SUPPORT AROUND THE "GOLF FOR BIODIVERSITY PROGRAMME"

Through the "Golf for Biodiversity Programme", the FGF has the ambition to promote excellence in the fields of knowledge, conservation and valorisation of the natural heritage of Golf structures. It must be demonstrated **by the attainment of the Gold level** by the greatest number of clubs. In order to qualify, clubs will have to design an action plan based on the silver level recommendations and consequently set up concrete management and development measures in favour of biodiversity.
A communication component for players, staff, media and local actors will also be integrated thanks to awareness-raising and training actions. The action plans have to meet the challenges of biodiversity and be as ambitious as possible. In that context, the French Golf Federation is mobilising to help clubs, providing **technical, financial and communication** supports. Such supports will be strengthened and organized through The **Gold level** currently under process.

The accreditation of the Golf Programme for biodiversity by the public authorities is essential to get their support. This public acknowledgement will then stimulate a collective dynamic at national and local levels. At the state level, the different Ministries (ecology, agriculture, food supply and sports) signatories to the golf and environment master agreement, have committed to encourage virtuous initiatives of the golf sector. Locally, region authorities are responsible for their infrastructures (1/3 of the golf facilities belong to them) and also for the existing biodiversity on their territory. Their mobilisation is a key factor to support the clubs in the process. Water agencies are also intended to protect the aquatic ecosystems severally damaged in France but paramount for the biodiversity (40% of the wetlands destroyed over 50 years). Depending on the context and considering the existing surfaces and aquatic areas, the Golf structures may benefit from water agencies financial aid schemes. It will help them to conduct development projects, natural areas management and state of health monitoring, including the dependent biodiversity.

In a complimentary way, the golf economic sector (representative organisations, distributors, equipment manufacturers, service providers, suppliers…), private actors (large water companies, water suppliers, energy and environment foundations…) and the golf practitioners included, are successful factors for the allocation of resources to the development of clubs action plans and the acquisition of the Gold level.
To achieve this end, an endowment fund is currently being set up.
In terms of, technical support Raising naturalist actors' awareness about biodiversity at stake on golf courses, will help them to work alongside with the clubs committed to the programme.
Supported by the Museum, the French Golf Federation will organise technical days with naturalist structures and will set up annual professional training sessions for clubs (management teams, front desk and field teams, etc…). In order to encourage a wide sharing experiences, the French Golf Federation, will enforce a « community of practice » through the creation of a platform to exchange and inspire around biodiversity-friendly management practices and ecological engineering actions.

AMPLIFY COMMUNICATION AND MEDIA COVERAGE

The media coverage dedicated to environment themes and the biodiversity in particular, is becoming more and more important. As a matter of fact, it responds to the growing public interest and a genuine awareness of the bond between our future and species & habitats surrounding us.

This trend is a real opportunity for the golf world to make the courses ecological qualities, the actions carried out and their virtues more visible. Surfing on this dynamic should create a knock-on effect on the clubs' participation to the Golf for Biodiversity Programme. The environmental communication, specifically that oriented towards the interest of Golf Clubs for the biodiversity conservation, represents a real lever for the activity promotion and its future.

As far as the French Golf Federation is concerned, it means developing several new forms of contents on its own media:

- By creating original environmental issues on the various social network channels.
- By developing a knowledge sharing, featuring articles on the labelled clubs' remarkable biodiversity and their positive actions,
- By regularly publishing in the newsletters and on the French golf Federation website, articles about the golfs' positive impact contribution to the environment and the society.

This dynamic on the media will find an echo in the press relations that French golf Federation keeps with independent external media. The press department will be responsible for encouraging media giving them access to a content distribution platform (press release, photos, videos).

The French Golf Federation intends to use another lever, the event communication based on:

- The resonance of major competitions, such as the French open and in 2024 the Olympic games. Indeed, in view of the work carried out with the National Museum of natural history the National Golf Course, Biodiversity and Landscape plan at the National Golf Course *(see page 24 « Biodi Plan »)*, these events are an opportunity to add an environmental dimension to the sporting one (spectators' raising-awareness, French Golf Federation with a connection to the external media).

- The organisation of original events dedicated to environmental issues, more specifically on the theme of biodiversity. With regard to the numerous works and the concrete results already achieved, the French golf Federation wishes to enhance its approach and is considering, with the Museum and R&A support, to organize an international conference in France. Sharing its experience, getting a better understanding of the events carried out in foreign countries and exchanging around Golf Clubs biodiversity with the golfing and scientific international communities, are among the main purposes of the planned conference.

- For example, the Biodiversity Golf Programme is based on reproducible inventories methodologies and therefore transposable to other territories, mainly in Europe and overseas. This scheme supported by the R&A since its genesis, can serve as a model and inspiration source, for the golf sector.

DEVELOP THE "LANDSCAPE AND BIODIVERSITY" ACTION PLAN AT GOLF NATIONAL WITH A VIEW TO THE 2024 OLYMPIC GAMES

Hosting major competitions at the National Golf course such as the Ryder Cup in 2018, the World Championship, the 2022 World amateur team games, the 2024 Olympic Games in Paris and also the French Open, implies a significant logistical organisation and a specific preparation of the course both for the game and spectators hosting. Such events have an impact on the site life and a systematic specific attention to biodiversity must be conducted. In order to prevent and limit the impacts of the 2018 Ryder Cup, recommendations were made to the National Golf Course before the event. This was achieved thanks to the technical expertise of the Museum, notably through an assessment methodology (Ecological quality index. -Delzons et al 2020), previously implemented in 2016. After the competition, a new EQI expertise was conducted in 2019 and an action plan called «Biodiversity and Landscape» was produced to pursue the Golf National accompaniment. Through scientific monitoring protocols, a study is being carried out in order to assess the biodiversity resilience of the site. The objective is to enhance the biodiversity hosting potential of the site by adapting habitats management in the most favourable way. This plan is intended to be continued to enable the Golf national to obtain the Golf for biodiversity programme Gold Level, in the perspective of Paris Olympic Games in 2024.

RESEARCH AND DEVELOPMENT WORKS

The French golf federation and the Museum are planning to carry out works in innovation ecological engineering fields, knowledge collaboration with research laboratories and also a behavioural study on the golfers, employees, super-intendants and golfing contributors' biodiversity perception.

DESIGN A PRE-DIAGNOSIS TOOL FOR NEW GOLF COURSES PROJECTS

The golf sector development and number of golf players increase are shared through the creation of new golfing facilities.

According to the new courses projects studies carried out by the French golf Federation, some French geographical sectors may be deprived with square meters or on the contrary have vast land for their future facilities.

When seen as a development tool of the territory, a new facility aims at responding to economic and social issues in order to provide local sports facilities, jobs, a wide range of associative services and a social life. This way it can contribute to the tourist and territory attractiveness.

From an environmental point of view, a golf facility implementation in peri-urban areas, can help to rehabilitate derelict areas, improve the living environment, regulate rainwater and create potential biodiversity hosting areas participating to ecological continuities.

An optimal match between the planned implantation (9 or 18 holes or more) and the geographical influence area determines the balanced and sustainable exploitation of a future equipment and therefore its ecological sustainable services. The implementation of a new infrastructure must be respectful of the environment in terms of the biodiversity, water resources and nature preservation.

A sustainable approach will indeed reduce the risks of administrative complications for a new project, giving it more chance of coming to fruition.. Same observation regarding the possible additional costs related to the extra studies and reduction/compensation measures linked to the environmental impact. Finally, all preventive efforts will reduce the possible disputes with the inhabitants and local environmentalists, leading sometimes, to pure and simple withdrawal of the project.

The French Golf federation support system for project holders provides a set of documentation in the "Golf course building and Environmental Management guide". Thanks to this support system an extensive study may also be conducted to assess the adequacy between a project and its catchment area (golfing context) in addition to the implementation of the technical, regulatory and financial feasability studies. The French Golf federation wishes to supplement this system by creating a new decision making tool, based on an environmental pre-diagnosis supported by the National natural History Museum scientific expertise. **This new tool will assess the biodiversity within a site, highlighting the existing ecological stakes and those present within the location territory.**

By identifying biodiversity issues, the project holder, and his architect, will be able to assess the management/planning, avoiding any form of impact, preserving the areas at stake, designing a compatible and legitimate project accepted by the authorities in charge and the locals. This anticipation tool linked to the land management, will confirm or contest the compatibility of a site for a project, the constraints, the available surface area for the golf course and the implementation of infrastructures. It will finally determine the planning of a possible facility and build a sustainable economic model. This tool will obviously not substitute to the environmental regulatory studies .

GOLF COURSES: A DEFENCE AGAINST URBANIZATION

When located close to cities, golf courses are an alternative to massive urbanization.
They contribute to cut the amount of carbon dioxide, absorb solar energy, reduce energy consumption, leading to the global warming decrease. One hectare of turf grass provides the necessary oxygen for 150 people and captures the pollution of about 30 cars. On a hot day, the temperature of the grass is 10 degrees lower than the temperature of the asphalt. A 5000 square-meter lawn has the power of cooling 70 tons of conditioned air. The urban areas ambient temperature can exceed 5 to 7 degrees the temperature of surrounding rural areas. Thanks to its cooling effect the lawns dissipate the urban heat spikes.

Natural grass - a green heart for the planet.

The studies* show that turfgrass possesses **3 main types of qualities**

Functional qualities
- Atmospheric pollution control.
- Soil protection against erosion.
- Depolluting water filter
- Heat catalyst
- Dust trap
- Sounds nuisance reducer
- Animals nuisance reducer

Recreative qualities
- Psychological balance
- Sanitation
- Safety sports practice
- Public approval

Aesthetic qualities
- Infrastructures valorisation
- Vegetation enhancement

Source: Lawn French society

ACTING FOR THE PRESERVATION OF THE WATER RESOURCE.

80% of the French golf courses are or will be in an increasingly precarious situation if climate change continues to affect the water resource. The massive development of alternative solutions to the sampling from the natural environment and the use of drinking water is an ambitious and necessary response the golf game future . However, such a transition implies important structural investments for clubs. , In view of their current economy, these investments may not be considered as a priority and be realistic in the medium term, especially if they were to be solely based on clubs investment capacity. A targeted and proportionate approach represents a pragmatic middle way to continue the transition already in progress and to effectively coordinate the speeding up of technical and financial support as well.

DEVELOP ALTERNATIVE SOLUTIONS TO NATURAL WATER WITHDRAWAL AND DRINKABLE WATER

A targeted approach consists of prioritising action for golf courses located in territories where the water resources is under great ang growing pressure (>300 golf structures) and those using water from the public network (10%).
On the one hand individualised audits will permit to identify priority measures to save consumption. On the other hand, clubs will assess the relevance of the alternative solutions with regard to their respective technical constraints and the comparative analysis costs/profits. In tourist areas and in particular on the coast (> 100 golf structures), alternative projects reusing treated waste waters from the plants treatment, are particularly relevant. In such contexts, the increase in population during the tourist season induces an increase of the volumes of water to be treated.

These quantities of water, then discharged into the natural environment, are quickly found at sea when they can be valued , if substantial, to satisfy the watering needs of nearby golf courses or communal green spaces, crops watering and irrigation systems. At the present time, about fifteen golf courses in France are adopting this solution which is little compared to other countries like the United States (Florida, California..) and Spain, where reusing treated waste waters is massively deployed. Current regulations, technical constraints and the connection works costs, make difficult the implementation of these very virtuous projects on a territory. A national diagnosis about the opportunities for the development of these systems through a cost-profit analysis, would demonstrate their economic and environmental impact and widely promote them.
Regarding golf courses, collecting water from the natural environment, the proportionate alternative would be to create a collection and rainwater storage network, the capacity would be calibrated to allow, a sufficient water volume at disposal in order to meet the greens annual watering requirements in case of drastic water restrictions. Such a Taylor-made network will be cheaper and technically less restrictive to be implemented, than a network dimensioned to totally overcome the sampling in the natural environment.

The storage design structure may also incorporate principles of ecological engineering to provide an additional environmental added value through the creation of new aquatic habitats for biodiversity.
Finally, two complementary « zero rejection » approaches can be developed on golf courses such as

- water retrieving, treating and revising washing stations for cleaning maintenance equipment.
- In situ waste-water treatment systems generated by the buildings, restaurants, hotels. These structures already exist and have been able to prove their pertinence and their effectiveness.

REDUCING WATER CONSUMPTION

Should the climate change scenario accentuates the pressure on water resource the access to water would be arbitrated between the different uses, like the agriculture and drinking water supply, and among leisure activities, golf clubs irrigation won't be then a priority. For 80% of the golf courses a preserved access to water resource will mainly pass through the demonstration of their sobriety and their progress approach, in front of public authorities and the public opinion.
When the implementation of an alternative solution to water withdrawal from the natural environment or from the public network is complex to set up, numerous technical and agronomic approaches will be a support to a better watering management. Significant efforts have been made by the French golf courses in terms of water consumption reduction which have been measured in the framework of several club surveys between 2006 and 2013. Thus, several studies have been carried out to identify the main levers to be developed to reduce water consumption. The promotion of financial support schemes for studies and works aiming at reducing the impact on water resources have been set up thanks to the information campaigns in golf centres. Some pilot schemes were initiated and animated by the French Golf federation (French golf federation convention and Loire Brittany Water Agency 215-2018).

Technological progress in irrigation performance networks and IT management have been considerable for 2 decades. These new technologies permit to react in real time and adapt according to, the weather conditions and soils humidity, in order to optimise the vital water supply covering and uniformity... In fine such technologies ensure a monitoring, measurement and a very precise control of the water volumes used. In France many golf courses were built between the 1980s and 1990s.Their irrigation systems, if not renovated or improved, are obsolete or even faulty today.

By supporting golf centres investments in new watering technologies, the impact on the water resource can be significantly reduced.

Cultivation practices are also a key solution to reduce water consumption. The regular flora conversion and topdressing operations enable to set up new grass species developed by seed suppliers. These species offer both greater resistance to the lack of water, diseases, mowing operations and trampling. Performant deep aeration equipment will act on the soil profile and optimize its water storage capacity. These operations favour deep turf rooting inducing a resistance to the lack of water, spacing out the watering process and the amount of fertiliser intakes.

These cultivation practices will effectively be deployed thanks **to a more efficient maintenance equipment acquisition or renewal and by, enabling the field teams to have access to training modules and resources dedicated documentaries** *(Environmental impact of golf courses management guide 2017).*

The studies carried out have shown that the use of water by golf courses in France, is highly regulated and the impact on our territories is globally moderate regarding the different water resources.

WATER SAVINGS VALORISATION AND ALTERNATIVE SOLUTIONS

Nevertheless, the public perception about golf courses water use, is wrong, negative or even fantasist. **A transparent demonstration of the reality regarding the water used by golf courses**, the important dynamic of progress undertaken by the sector, **concrete results** obtained in terms of water reduced consumption, must deconstruct these preconceived ideas.

The goal is to gain **a better acceptance of the activity** by the most and thus contribute to its future development.

In order to enhance this dynamic, **communication actions, articles, reports, videos and surveys have been carried out since 2006** at the level of the French golf Federation.

However, the development of mentalities requires a lot of efforts and time. This dynamic initiated by the French golf federation must be amplified both through its own media support (social networks, website, internet, newsletters…) and the external media, under the press relations department. Golf clubs, must also become more pro-active with local media and at least with their members and the public bodies they are working with.

The French Golf federation has planned to supply clubs with **the appropriate communication tools to encourage the implementation** of such actions and also contribute to a rewarding compendium of good practices. A new survey will be conducted by 2024 to update the existing data and highlight accomplished progress.

STRENGTHEN SUPPORT FROM THE MINISTRY OF ECOLOGY AND WATER AGENCIES

Golf courses drawing water from the natural environment or from the public water supply system are subject to the tax for water resource withdrawal. These fees, like the pollution fee, paid when purchasing phytosanitary products, are refunded through financial supports for actions aiming at a **better management of water resource and aquatic environment.** Whether public or private, all golf courses are eligible to water agencies financial support. There are 6 large water basins in France, led by their own agency. Each of them implements a support policy, taking into account the specific context of the basin and its priorities.

Since 2006 and the signature of the first **water Charter** the French Golf federation has approached the water agencies to promote their financial aid schemes towards golf structures. Several Loire-Brittany studies have been carried out with the water agency assistance to identify the surroundings priority actions for which they were eligible to financial assistance. On the basis of these studies, golf clubs have regularly requested water agencies to initiate surveys and works to reduce their impact on the water resource. Due to the increasing pressure on water, a greater number of golf courses currently solicitate this type of support. In 2015, in the same Loire- Brittany basin, a « pilot » agreement was signed between the French Golf Federation and the agency in order to enable golf clubs to benefit from the more favourable financial aid. The FGF plays an important role of leadership by giving advice and support to undertake studies and works aiming at reducing courses impact. Nearly 30 projects were implemented, representing an investment of more than 4 million € and a financial help for golf courses of 2 million euros.

This pilot experiment at a level of a hydrographic basin has been very positive. In the future it will be reproduced with every water agency. The renewal of the master agreement with the Ecological transition Ministry (the water agencies Ministry), “Golf and environment”, **will facilitate the rapprochement between the golf industry and the agencies, deploying more widely this type of initiative.** It will amplify a sustainable dynamic of the water consumption, implement alternatives to natural environment and public system withdrawals.

ACTING FOR GOLF COURSES SUSTAINABLE MANAGEMENT.

PRESERVING DIALOGUE WITH ALL STAKEHOLDERS

Renewed in 2019, the master agreement signed between the state and the golf course sector, aims at maintaining consultation regarding **the projects development, of common interest**, and mainly the transition toward the withdrawal of phytosanitary products use on sports lawns (golf, football, rugby, horse racing…).

In order to carry out this consultation with the public authorities, a collective of **contributors in the sports sector**, has been set up under aegis of the ministry in charge of the sports (French sports Federation, football, rugby, golf, National rugby League, professional football League, hippodromes mangers, the Ecoumène Golf and Environment Institute.).

The first concrete action of the collective was to carry out a diagnosis on an unprecedented scale since it draws up a complete inventory of the phytosanitary products use on all sports turf in France. This work mainly evaluates the deadline and the conditions for a successful transition (research programmes, epidemio monitoring, new materials acquisition, management training…).

In order to get rid of the chemical products use on sports turf, a priority action plan is implemented thanks to the support of the local authorities, in horizon of the 2024 Olympic Games in Paris, to raise an initial assessment, measure the achieved projects and set the new objectives.
In Europe, research projects on turfgrass have been led by firms whose products seem to be now challenged by public opinion due to their impacts on the environment and biodiversity. Faced with the uncertainty of a new molecule approval, these firms could cut their research investments.
The Ecoumène Golf and Environment Institute is the only French institute specialised in lawn surfaces. It has got the approval from the food and agriculture Ministries to carry out official tests.

RESEARCH AND DEVELOPMENT PROJECTS

Some research projects based on the development of integrated fight against the lawns pest are listed below:

- **The establishment of species collections** defining resilient and adapted turf varieties to the different soils and French climates (Isorisk observation of untreated plots, tool sheets creation for each harmful organism targeted by the modelling, arousing the seed companies interest in the process.)

- **The development of new tools** for micro-organisms and weeds diseases, detection and surveillance. The MODEGE programme, supported by the Ecological transition Ministry in collaboration with the US Department of the State of Oregon, aims at developing mathematics predictive models of organisms lawn pests appearance. These models are based on meteorological data analysis. It is necessary to develop a virtual weather stations network in order to feed the models and create a professional social network for issuing epidemio-surveillance local alerts.

- **Multifactorial studies** contributing to the development of new knowledge regarding the biocontrol specialities integration. Cultivation methods, fertilisation and irrigation systems.

- The creation of **integrated vegetation index tools** to standardised differences (NDVI) adapted to mowers or drones in order to obtain an accurate observation on the plants stress level. This will help in taking decision about the cultural operations and the appropriate bio-stimulants application.

- **Development of image processing techniques** associated with artificial intelligence to detect and locate weeds at an early stage of development. An embarked device on sprayers or extractors can drastically reduce the total herbicides quantities used.

TRAINING AND RAISING AWARENESS

- **Super-intendants training and teaching** modules through the implementation of varietal collections and associated integrated managament, Certiphyto (phytosanitary products application Certificate), use of new decision making tools for Turf Management (ADO), organic control certification adapted to lawn gestion.

- **Support to Golf Clubs** for the investment in transition equipment via financial aid programmes from water agencies.

- **Raising golfers' awareness** in connection with the French National Golf Biodiversity studies, to convince them about the absolute necessity of new cultivation practices to obtain the best conditions for golf surfaces conditions the whole year round. It also means promoting super-intendants and greenkeepers status, demonstrating a good golf manager needs a wide range of skills

70% of the global golf course surface is Zero Phyto

WASTES MANAGEMENT

Golf facilities objectives in terms of waste management are:

LIMIT WASTES PRODUCTION

- When purchasing golf course items, consider the importance of the packaging in order to reduce waste volumes (packing, toxic and non-recyclable waste…).
- The absence of waste bins can motivate golf players to manage their own waste. This implies carrying out awareness raising actions.

RECYCLE AS MUCH AS POSSIBLE AND AS ECOLOGICALLY AS POSSIBLE

- Setting up, in collaboration with recycling structures, selective waste bins dedicated to golf maintenance scrap.
- Putting in place selective sorting bins for golf players.
- Considering arrangements for collecting used sports material in terms of processing, transformation, recycling and valorisation. For instance, by giving a second life to the sports equipment, donation to educational organisations to promote and introduce the activity to disadvantaged groups in developing countries or by organising collecting and reconditioning operations of lost balls transforming golf equipment into art, sculptures, home-made objects…

RECOVER AND ELIMINATE *IN SITU* OR VIA SPECIALIST SECTOR

- Glass and recycled packaging in specialised recycling channels.
- A maximum of *in situ* green waste treatment (grass clippings from mowing, reused in composting, shredding and mulching) or processed by a specialised sector. Creation of composting areas to produce reusable natural compost.
- Hazardous waste dropped in waste disposal facilities or collected by specialized channels (e.g Adivator) or even by the suppliers themselves.

REDUCE WASTE PRODUCTION BY RAISING AWARENESS AMONG PLAYERS

- The installation of informative displays at the collection and passage points (e.g the eco-golfer 10 gestures) and by encouraging players to manage and sort out their own wastes.
- Launching communication campaigns for the promotion of an accountable consumption: giving the priority to reusable products, without packing, being healthy and non-industrial (e.g design an attractive and eco bottle to be distributed to players to replace plastic bottles).

2019 French golf federation awareness campaign

TAKING ACTIONS FOR A MORE INCLUSIVE GOLF

Golf structures must take ownership of environmental issues and turn their territories into real assets contributing to their legitimacy and image. Numerous opportunities are available to enhance the golfing sites ecological interest thanks to the actions undertaken to improve their image and their territorial anchoring within different communities.

SPACE MULTIFUNCTIONAL USE

Golf practice is perceived as an exclusive and closed activity. It is thus necessary to integrate new recreational facilities to gain an enlarged community acceptance.
This pro-active approach, consisting in developing the space sharing to safeguard clubs future interests, facilitate the public access to future sports, education activities and training. Thus health, well-being and the quality of life will be improved thanks to the creation of thrilling and innovative opportunities flourishing in the golfing centres.
Due to limited land, security constraints...all the current sites may not easily identify the existing possibilities to increase a multifunctional use.
Nevertheless, through the accessibility and diversification optimisation of existing courses, especially those in the more densely populated metropolitan areas, golf courses could be recognized as « community green spaces ». Consequently, such clubs can familiarise a wider public with the golf game.
The existing access roads equipped to ensure the golf players' safety, could be linked, opened or created, to foster walking paths networks into the wild (cycling and running lanes, picnic areas, biodiversity and environment educational trails...). Abandoned areas may have new vocations and deliver ecosystem services (local species preservation, scientific biodiversity works, conservatory orchards, food supply/permaculture...). All these suggestions can be envisaged within local partnerships framework (local authorities, associations and residents, schools, ...) and will contribute to the local anchoring reinforcement of clubs and their economic, social and environmental territory added-value.

SPORTING OR LEISURE ACTIVITY

Clubs can act in favour of a better integration in different ways. Golf courses can get involved in charities events or in financing their own environmental actions through competitions or golfers participatory financing operations.
For example, the participation to the "Golf Programme for biodiversity" or the branches programmes, or by supporting general interest actions pursued by the endowment fund, FFGREEN (research, education...). The players are the best golf practice ambassadors. Thanks to operations above they have the possibility, through a virtuous and rewarding way, to release a positive image of the golf game.

CONCLUSION AND PERSPECTIVES

Considering the climate change challenges, the increasing pressure on resources and the environmental regulations strengthening, it is vital for golf stakeholders to launch an ambitious ecological transition plan. Such a plan will help to safeguard golf courses activities and the game attractiveness.
The unescapable transformation induced and called by the community, constitute an opportunity to radically change the perception of golf and promote its future evolution. The golf discipline actually has a great ace to play at a time when surveys among French sportsmen put forward their increasing aspirations for nature related sports.

The objectives of the program must be shared by all stakeholders and **"Golf Course 2030"** provides a suitable ground to organise an unprecedent engagement. The present road map covering the 10 coming years, highlights the collective efforts to be engaged to drive the numerous general interest projects in terms of research, clubs support, raising awareness, etc...
Indeed the key factor of success remains in our capacity to commit energies around these projects.
The FFGREEN endowment fund, recently created by French golf organisations, has to bring together these energies and resources to deploy the French golf ecological transition plan.

At a local scale, climate change effect, water resource availability and regulation context will differ from one region to another. Challenges prioritization and actions to be taken will vary. Each club will then have to appreciate the scope of its own challenges and put them into perspective with neighbouring clubs. Although they could compete with each other, the pooled actions and synergies of clubs constitute a precondition to the long-term survival of many golf facilities.
Indeed, the closing of a facility must not be the condition to save another one. Such a strategy would be catastrophic for the development and practise of the game in France as the interrelation between the number of golf players and the number of golf structures is now well established.
In order to launch these local dynamics and coordinate the action, the support of the Regional golf leagues and volunteers, together with clubs' territorial relationship managers and FGF, must be strengthened. Moreover, investments in terms of recruiting and training will then be paramount.
Thanks to the meaningful commitment of all golf stakeholders to the present road map, the French golf industry will significantly reduce its ecological impact.

Professional and any handicapped players, volunteers and investors... will be proud of their participation and contribution to the active movement towards a sustainable golf practice for the present and future generations.

CONTACT
Direction Territoires Environnement et Équipements
68, rue Anatole-France
92309 Levallois-Perret Cedex
Tél. : 01 41 49 77 25 - Fax : 01 41 49 77 01
environnement@ffgolf .org

ffgolf®

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