GOLF COURSE 2030 FINLAND

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.

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GOLF COURSE 2030 FINLAND

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.

R&A inherited its name from the Royal and Ancient Golf Club of St Andrews, from which it split in 2004. 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.

Golf Course 2030 Finland is the Finnish version of the R&A-published initiative, adopted by the Finnish Golf Union.

GOLF COURSE 2030 PROCESS

The process for achieving the objective of 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.

1. Introduction

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. A wider view encompasses the whole golf sector and golfers.

Factors contributing to the optimal condition and playability of a golf course are presented in Figure I.

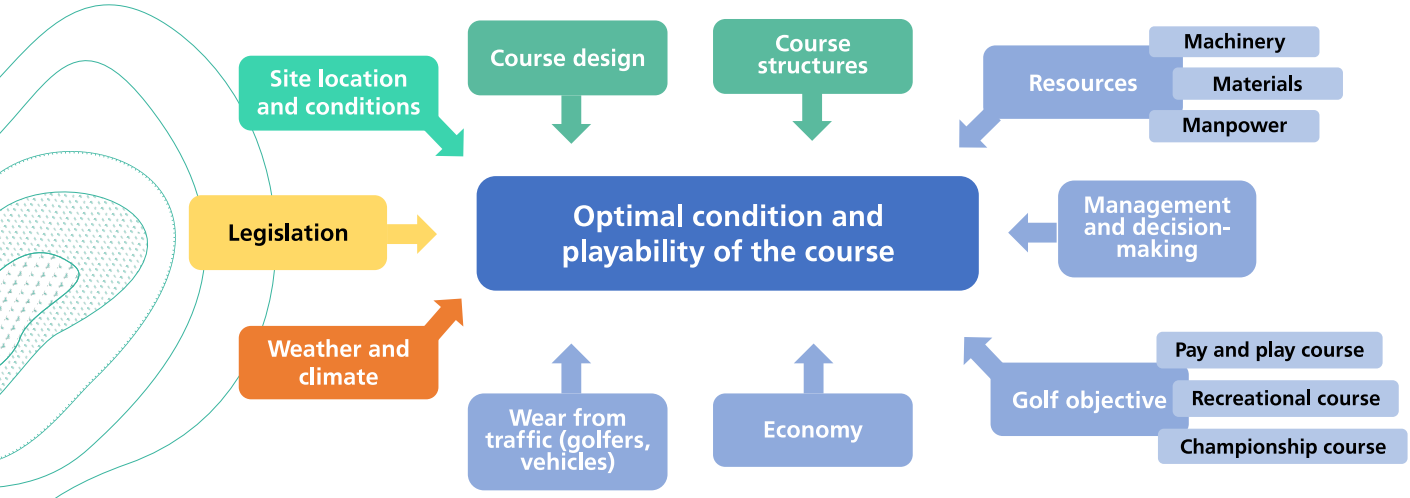

Figure I. Factors contributing to the optimal condition and playability of a golf course.

Fifteen years ago, Scandinavian golfers were proactive and at the forefront when they decided to promote sustainable golf research for € 0.5 / member per year. This decision has been noticed worldwide. This far-sighted decision to invest in research is an important investment by the golf sector today to ensure the high quality of golf courses, minimize the factors contributing to climate change, halt the acceleration of biodiversity loss and meet the growing demand for sustainably managed green space in urban areas.

Practical research results are an important tool for preventing the negative effects of action on the planet, and new knowledge is needed to change people's thinking and attitudes globally. A global agenda is needed to guide this work. Currently, the best available agenda is the Agenda 2030 and its 17 Sustainable Development Goals (SDG, Figure 2), adopted by the United Nations in 2015.

Figure 2. The UN Agenda 2030 for Sustainable Development and its 17 goals guide global development towards a more sustainable, equitable and better world. (Source: UN)

At their best, golf courses can contribute to the promotion of many sustainable development goals, either directly or indirectly (Figure 3).

SUSTAINABLE DEVELOPMENT GOALS	PROMOTION AT GOLF COURSES
GOOD HEALTH AND WELL-BEING Ensure healthy lives and promote well-being for all at all ages	Health benefits of golf
CLEAN WATER AND SANITATION Ensure availability and sustainable management of water and sanitation for all	Sustainable water usage, using reclaimed water, minimising water pollution
AFFORDABLE AND CLEAN ENERGY Ensure access to affordable, reliable, sustainable and modern energy for all	Energy efficiency, renewable electricity, biofuels
INDUSTRY, INNOVATION AND INFRASTRUCTURE Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Research and development of turfgrass species, pest management and fertilisation
SUSTAINABLE CITIES AND COMMUNITIES Make cities and human settlements inclusive, safe, resilient and sustainable	Golf courses as active participants of local communities, multi-use of golf courses
RESPONSIBLE CONSUMPTION AND PRODUCTION Ensure sustainable consumption and production patterns	Sustainable procurement, minimising waste, circular economy
CLIMATE ACTION Take urgent action to combat climate change and its impacts	Cutting climate impacts (travel, fuels etc.), carbon sequestration at the golf course
LIFE BELOW WATER Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Minimising emissions to water
LIFE ON LAND Protect and restore terrestrial ecosystems, sustainably manage forests, halt and reverse land degradation and halt biodiversity loss	Increasing biodiversity at golf courses
PARTNESHIPS FOR THE GOALS Strengthen the means of implementation and revitalize the global partnership for sustainable development	Co-operation for sustainability within the golf sector and externally

Figure 3. The golf sector's perspective on the UN Sustainable Development Goals

Environmental impact and sustainable development play an important role in the research and development activities of STERF (Scandinavian Turfgrass and Environment Research Foundation). In its programs, STERF promotes many of the UN's Sustainable Development Goals:

- Sustainable use of natural resources and chemicals (SDG 6, 12, 14, 15).
- Ecosystem services and the promotion of biodiversity (SDG 14, 15).
- Adapting to a changing climate and minimizing the factors contributing to climate change (SDG 13).
- Sustainable Cities and Communities (SDG 11).
- Healthy life and well-being for all ages (SDG 3).
- Cooperation and Partnership for Sustainable Development and Legislation (SDG 17).

These categories and objectives are closely linked to the day-to-day challenges of golf and lawn cultivation, as well as to STERF's programs, projects and knowledge-sharing efforts. In order to maximize the impact of the work on the sustainable development of the golf and turfgrass sector in the future, it is of the utmost importance to establish international and interdisciplinary cooperation where all stakeholders are ready to work together and focus on Agenda 2030 as a guiding document.

Information on STERF programs, projects and activities can be found at www.sterf.org

Information on the Golf Course 2030 can be found at www.randa.org/sustainability/golfcourse2030

2. Drivers for adaptation – Challenges and opportunities

Over the next decade, the golf and turfgrass industry faces a number of major challenges, including providing a high quality arena for golf and other sports, and at the same time responding to increased environmental regulation, rising pressure on natural resources and rising operating costs of key inputs including labour, energy, fertilizers and plant protection products. The industry also needs to plan for adaptation to climate change and play a credible part in minimising factors affecting climate changes. These factors will also present opportunities for the enhancement of golf facilities and their contribution to nature and communities. The challenges and opportunities in the golf industry are presented in Figure 4.

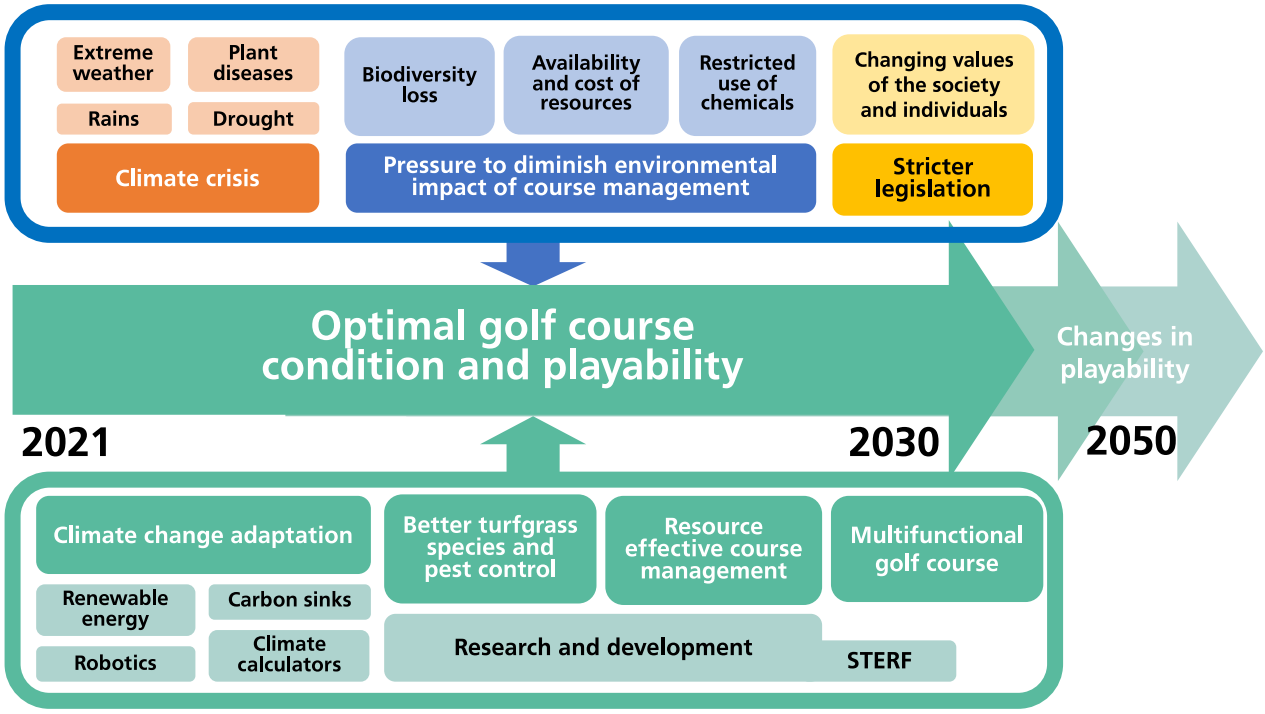

Figure 4. Expected change pressures in the golf industry and how to respond to them

National and international regulations

European Union and its member countries are seeking to achieve greater levels of environmental protection. All sectors including turfgrass management will inevitably be subject to increasing levels of environmental regulation and monitoring. As a consequence, golf and turfgrass facilities are under scrutiny to demonstrate compliance with national and international regulations, including for example, the EU Directives relating to pesticides, habitats, water, soil, nitrates, phosphrous and chemical pollution.

Although there are many examples of best practice within specific turfgrass sectors (e.g. golf), there are also well publicized examples of malpractice, and hence significant opportunities to improve existing levels of management, knowledge and awareness across the broader turfgrass industry. The golf and turfgrass industry should take a lead in research and development, training, knowledge transfer and dissemination of best practice, not only for existing venues and but leading innovation in the design and management of new golf and sportsturf facilities.

High quality playing surfaces and Integrated Pest Management (IPM)

The production of healthy turf while safeguarding environmental quality and providing a toxin-free environment is a high priority within the European Union. In this context, the golf and turfgrass industry must play its part by providing high playing quality and at the same time reducing dependence on chemical plant protection products. The EU Directive 2009/128/EC has introduced an integrated approach to pest and disease management as the driving force for producing healthy turf and to reduce the use of and dependence on pesticides.

The concept of Integrated Turfgrass Management (ITM) is a broader approach than IPM that increases understanding of plant diseases and pests, improves plant resistance to both pests and climatic stresses, and develops common management techniques for new and improved grass varieties.

The main focus of IPM and ITM is a decision making process utilizing all suitable techniques to produce high quality turf and to minimize pest damage and pesticide use below those causing economically unacceptable damages or loss. The implementation and success of IPM requires increased focus on education and development of documentation tools. In addition, research and development will be key.

Natural resources and climate change

The availability and sustainable use of our natural resources and natural capital – soil, water, air, raw materials, nutrients, energy – are worldwide challenges. In Finland, natural resources are consumed faster than they are renewed. In recent years, the Earth Oveshoot Day has fallen globally on the turn of July-August, but in Finland already on April.

The downward pressure on our natural resources and capital, including land, water, nutrients (phosphorus) and energy is of major global concern. Reducing resource consumption and increasing resource efficiency will be key. From a golf and turfgrass industry perspective, it also makes business sense to reduce costs and waste through efficient consumption of water, energy, materials and fertilisers . New knowledge and research results can help the sector become more efficient and hence reduce consumption of natural resources.

Changes in climate will have significant and profound implications for the turfgrass industry which relies on natural resources and co-existence with the environment. For turfgrass facilities investing in new infrastructure, many will need to factor in the costs of a changing climate, and develop appropriate adaptation strategies to cope with greater uncertainty and extremes in rainfall and temperature. Climate change will also influence turfgrass growth and agronomy, with impacts on pest and disease control, and the need for irrigation and drainage.

In Finland, climate change is forecast to raise the average temperature more than the global average. The temperature will rise especially in winter. Rainfall and heavy rainfall are also expected to increase. Winters will be milder, wetter and cloudier, while long periods of heat become more common in summer. Rising temperatures are also expected to increase soil dehydration – this is due to increasing evaporation, and will be strongest in the spring. (Source: climateguide.fi)

Ecosystem services and biodiversity

The living conditions of people are influenced by our ability to co-exist with ecosystems and utilise them without over-exploitation. To halt the loss of biodiversity and the degradation of ecosystem services, the sustainable management of both the natural environment and cultural landscape needs to be achieved.

According to the International Panel on Nature IPBES (2019), biodiversity will be rapidly depleted around the world. About one million species of animals and plants are threatened with extinction, many in the next few decades. Nature is also impoverished in Finland. According to the latest survey, the Red List, every 9th species in Finland is already endangered. Every second Finnish habitat is endangered. (Source: Ministry of the Environment)

From an ecosystem management perspective, golf courses represent a promising measure for restoring and enhancing biodiversity in ecologically simplified landscapes, such as agricultural and urban lands. Golf courses could offer real potential to be designed and managed to promote critical ecosystem services, such as for pollination and natural pest control, providing an opportunity for joint collaboration between conservation, restoration and recreational interests. Golf courses could also have the potential to contribute to supporting wetland fauna, particularly in urban settings where they could contribute significantly to wetland creation.

Golf courses include large areas of land that are not used for the game of golf. Therefore there could be potential for better use of the land in order to provide new opportunities for active outdoor life for other groups in addition to golfers.

Finnish uide to pollinator-friendly golf course management

3. 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. 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 I and 3:

SCENARIO I

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.

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.

4. 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.

5. Stakeholders

Stakeholders who need to be involved in the design and implementation of the Golf Course 2030 process can be divided into three groups: key, support and international stakeholders.

Key stakeholders

- Golf clubs and their members
- Golf Courses Association Finland
- Finnish Greenkeepers' Association FGA
- Finnish Golf Managers' Association FGMA
- PGA of Finland
- Golf and turfgrass educational institutions
- Importers and dealers of golf course management products and machinery

Support stakeholders

- Golf course architects
- Golf course constructors
- Finnish Olympic Committee
- Environmental organizations
- Universities, educational institutions, research institutes
- Golf equipment importers and dealers

International stakeholders

- GEO Foundation for Sustainable Golf
- STERF Scandinavian Turfgrass and Environment Research Foundation
- R&A
- EGA European Golf Association
- IGF International Golf Federation
- FEGGA Federation of European Golf Greenkeepers' Associations

6. Process

The main objective of Golf Course 2030 is to help stakeholders develop a roadmap and specific action plans that will help those developing, designing, building and managing golf courses to address the challenges and opportunities from the changing climate, increasing resource constraints, and the regulations agenda facing the industry over the coming decade..

The roadmap will be designed, implemented and reported in collaboration with the Stakeholder Team. The aim is to identify measures that are important for the development of the Finnish golf industry, to draw up action plans for them and to implement them over the next 3–5 years. After the results and corrective actions, a new cycle is started from the beginning of the process (Figure 5.)

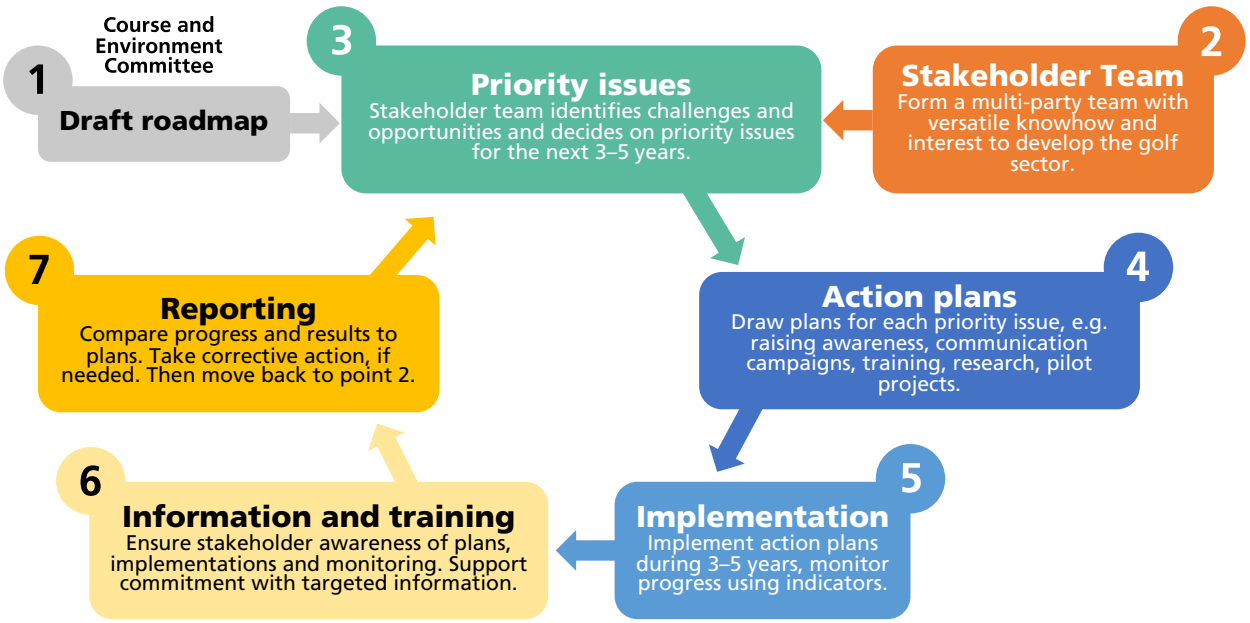

Figure 5. Flow chart of the Golf Course 2030 process.

1. The Course and Environment Committee has prepared this draft roadmap as a basis for future stakeholder action.

2. The Golf Course 2030 Stakeholder Team shall be composed of representatives of the various stakeholders.

3. Stakeholder Team will continue and deepen its analysis of pressures for change and scenarios in the golf sector. Based on the analysis, the team decides on priority issues and sets up Expert Working Groups for each priority issue to prepare action plans. The goal is to ensure the long-term vitality of the golf sector and focus on action to be taken over the next 3 to 5 years.

4. Suitable individuals with strategic and technical expertise shall be selected for the Expert Working Groups. The groups take into account the effects of climate change, resource scarcity and tightening regulation, and strive to form a clear picture of the current situation and future challenges. Representatives of the working groups will study the literature, best practices and technical developments in their areas of activity (within and outside the golf sector). The groups then draw up action plans to meet the challenges and seize the opportunities for each priority issue. The action plans take into account the scenarios presented in section 3.

The action plans include the following points:

- What are the challenges and opportunities that contribute to achieving optimal golf course condition and playability in the future?
- What are the solutions to these challenges and opportunities?
- What is required of different stakeholders (e.g., course superintendent, management, owners, golfers, equipment and product suppliers, legislators) to implement the action plan?
- What technical or behavioral changes in golf management are required to make the changes?
- What broader measures are needed to cover the whole golf sector, for example to promote research, training, support for golf courses, knowledge sharing, monitoring and reporting on progress, stakeholder relations, public awareness, etc.?

5. The Stakeholder Team will review the action plans and define the implementing bodies, timetables, performance targets and indicators for monitoring progress. The action plans are compared with international frameworks (STERF, GEO, OnCourse, R&A). The plans are then implemented.

6. The Stakeholder Team shall ensure that all interested parties are aware of the progress of the implementation and the results achieved, and are committed to carrying out the process and utilising the results.

7. The results of the findings are carefully analyzed, and corrective action is taken when needed. The Stakeholder Team communicates the results to all parties. The process will be repeated for the next 3–5 years, starting with steps 2 and 3.

7. Priority issues in Finland

Based on the preliminary roadmap, the Stakeholder Team analyses the challenges and opportunities in the golf sector and identifies information gaps that should be addressed. The aim is to identify and select the priority issues. Next, action plans are drawn up and the implementing body and timetable are decided for each priority issue.

Action plans and implementations take into account activities in other countries and organizations. For example, the STERF projects are being monitored and their results actively utilised. Best practices are identified by following the communications of the international partners, such as GEO, R&A, EGA etc.

The Course and Environment Committee of FGU has drawn up the following preliminary list of possible priority issues based on the Golf Course 2030 materials of some national golf associations and the operating environment of the Finnish golf sector and other applicable sources of information.

A Climate change mitigation and preparedness

The opportunities for golf courses to be carbon neutral or even carbon negative are good. Preliminary calculations show that reducing climate emissions from course management and other activities and promoting carbon sequestration in the golf course give encouraging results.

The first step is to be able to calculate the carbon footprint of the golf course. Suitable tools are the Carbon-neutral Golf Course project of the Finnish Golf Courses Association and GEO's OnCourse online service. Carbon footprint is also included to some of STERF's research projects. Furthermore, a golfer's climate calculator is being developed in Finland.

Climate action at the golf course include, for example, purchase of renewable electricity, in-house production of electricity with solar panels, use of biofuels, electrification and automation of course management machinery and reduction of players' traffic emissions, e.g. providing electric car charging points. Carbon sequestration on the golf course area can be increased by planting trees and shrubs, reducing the area of manicured grass and by restoring marginal areas to their natural state.

In Finland, rainfall is forecast to increase and heavy rainfall to become more common. Golf courses can prepare for this by building stormwater routes and catchments. Recovery and use of meltwater and rainwater for irrigation also gives advantages during the foreseen longer dry periods.

Climate change is likely to bring new plant diseases and pests and create additional challenges for course management and its environmental impact (see Priority issue C below).

Involving all Finnish golf courses in climate work is of utmost importance and requires efforts on many fronts. Information, training, motivation, calculations and learning are needed. In the future, financial support for climate work can be applied for from the Climate Fund Golf of the Golf Promotion Foundation.

B Biodiversity and multifunctionality of the golf course

Reducing the area of managed turfgrass can contribute to the biodiversity of the golf course area. Natural grass areas and the restoration of marginal areas promote both biodiversity and carbon sequestration. Trees can be planted, pollinator-favoured flower fields be sown and protected areas established on the course and its perimeter areas.

Many golf courses are already multifunctional. In winter, cross-country ski tracks and winter events are held on the courses, or there may be hiking trails and walking paths at their edges. The facilities of the clubhouse and the golf restaurant are also available to non-golfers. Cooperation is possible with a wide range of local stakeholders: schools, environmental associations, neighbours, other sports etc.

> *Think creatively. Why couldn't there be a beehive next to the ninth? Why couldn't we celebrate all the bird and animal species on the golf course that enjoy the same landscape we play in? Why couldn't schoolchildren come to spend time on the course, restore the landscape or plant trees?"*
>
> Sam Barrat, UNEP (Driving for net zero -panel discussion, Glasgow 11.11.2021)

C Minimising the environmental load of golf courses

The environmental impact of a golf course consists mainly of course management (fertilizers, pesticides, fuels, irrigation, other materials) and the energy consumption of buildings. Tightening legislation and environmental pressures are motivating the reduction of the use of both fertilizers and pesticides and the introduction of integrated pest management (IPM).

In responsible course management, the condition of lawns is frequently monitored visually and with suitable measurements. The nutrient load in the water is measured regularly. The quantities of different waste fractions, chemicals used, energy, irrigation water, etc. are recorded. Various indicators are used for monitoring the development, and the information is used in decision-making.

STERF's research projects are developing more sustainable, less input-demanding grass varieties and more environmentally friendly control methods. Experiments and pilot projects to test different alternatives are also needed on Finnish golf courses.

The environmental load can also be reduced by reducing managed turfgrass area and by adding protection areas at the edges of water bodies, etc. Measures to reduce the environmental load, together with changes in the environment and climate, may affect the playability of the course and the size of the playing area. In the future, golfers must accept that optimal course condition and extent cannot always be achieved and maintained.

D Availability of competent staff

Future changes will also be reflected in the course maintenance tasks and workload. It is important to ensure that a sufficient number of skilled golf course management staff work on Finnish golf courses. This requires efforts to increase the attractiveness of the sector and the popularity of education, as well as to develop vocational and continuing education.

E Open communication and transparent reporting

At times, golf has had reputation problems: an elitist sport that makes extensive use of harmful chemicals that end up in waterways and the sea. However, the transformation of the image from an environmentally harmful polluter to a responsible health exercise is already partially underway. This change can be accelerated by open and credible communication, both within and outside the golf sector.

Credibility can be enhanced by the widespread adoption of reliable sustainability and environmental tools: GEO certification, certified carbon footprinting, energy and waste statistics, nature and environmental surveys or annual reports made or certified by trusted parties. Collaboration with external stakeholders, such as environmental or nature organizations, can be fruitful.

Measuring environmental impacts and using indicators suitable for golf are important not only for development work but also in communication. In addition to carbon footprinting, the OnCourse platform also offers other indicators based on the annual data input by the golf course.

F Waste management and recycling

Waste management is already at a fairly good level in Finland and on Finnish golf courses. However, further efforts are needed in the first step of the waste hierarchy, prevention of waste. One way is to exchange as many disposable products as possible with durable goods. This applies to golfers, golf restaurants and golf course purchases. Systematic recycling of turgrass clippings and other green waste by composting could also be developed.

8. Action and communication plans

Action and communication plans for important measures and their implementation are made as described in Section 6 Process. Expert Working Groups are responsible for the operation, and the Stakeholder Team directs and supports the activities.

A key target group for communication is golfers, who need to be involved in the design and implementation of the development work. The desired state of mind for golfers is reflected in the statements below.

TOWARDS THE YEAR 2030 – ROLE OF GOLFERS

- We enjoy golf and are aware of its diverse health effects - we move around the golf course where possible by muscle power
- We value our co-players, golf course staff, the course and the surrounding nature – we don't disturb
- We are aware of the limitations of golf course management (climate, weather, regulatory requirements, finances) and we accept that the course may not always be in top condition
- We value the nature and its diversity on the golf course, and follow the conservation guidelines for nature sites
- We accept the use of the golf course area for other outdoor and recreational uses as well
- We take care of the course: we fix divots and pitch marks, we don't leave trash on the course
- We reduce our climate impact: we use the climate calculator of the Golf Climate Fund, we travel to the course using climate-smart transport, we recycle our old clubs and choose climate-friendly food and travel options
- We prefer courses that focus on sustainability: GEO certification, biodiversity, renewable energy, climate action (such as electric car charging points)
- We promote responsible and environmental action in our own networks