Chris Gray

HEAD OF SUSTAINABLE GOLF & AGRONOMY.

THE R&A.

SUSTAINABLE GOLF & AGRONOMY

The Club
The Membership
The Home of Golf

Heritage.

1754

The Royal and Ancient Golf Club of St Andrews was founded as the Society of St Andrews Golfers in 1754. As one of the oldest and most prestigious golf clubs in the world it took on responsibility for overseeing the Rules and staging championships before the formation of The R&A Group in 2004. The club has approximately 2,500 members from around the world and supports the committees which oversee the work of The R&A.

1860

The Open is golf's original Championship. Played since 1860 on iconic links golf courses, it is the sport's most international Major Championship with qualifying events on every continent. For one week each year, the pursuit of the famous Claret Jug trophy is the focus of the sporting world, followed globally by millions of fans.

2004

The R&A Group was formed in 2004 to assume responsibility for governing golf and running a series of golf's most prestigious championships including The Open. It has now taken on responsibility for running the AIG Women's Open and jointly stages the Senior Open presented by Rolex. The R&A reinvests the revenues generated by these championships in developing the sport and supporting its long-term prosperity and sustainability through its network of affiliated national associations and partners.

2021

The museum opened in 1990 as the British Golf Museum to house the Club's collection of golfing artefacts and memorabilia which date back to an original collection in the 1800's. Following an extensive redevelopment in 2021, **The R&A World Golf Museum** opened to visitors with redisplayed and reimagined galleries that tell the history of golf through a series of immersive and interactive displays.

2022

The R&A invests in supporting golf at all levels from grassroots to the professional game. As well as reinvesting the revenues generated by The Open back into the game, The R&A introduced a philanthropy programme to augment these funds and help it to do more to sustain the long term of future of golf around the world. Funds raised under this programme will be reinvested in the sport through **The R&A Foundation**.

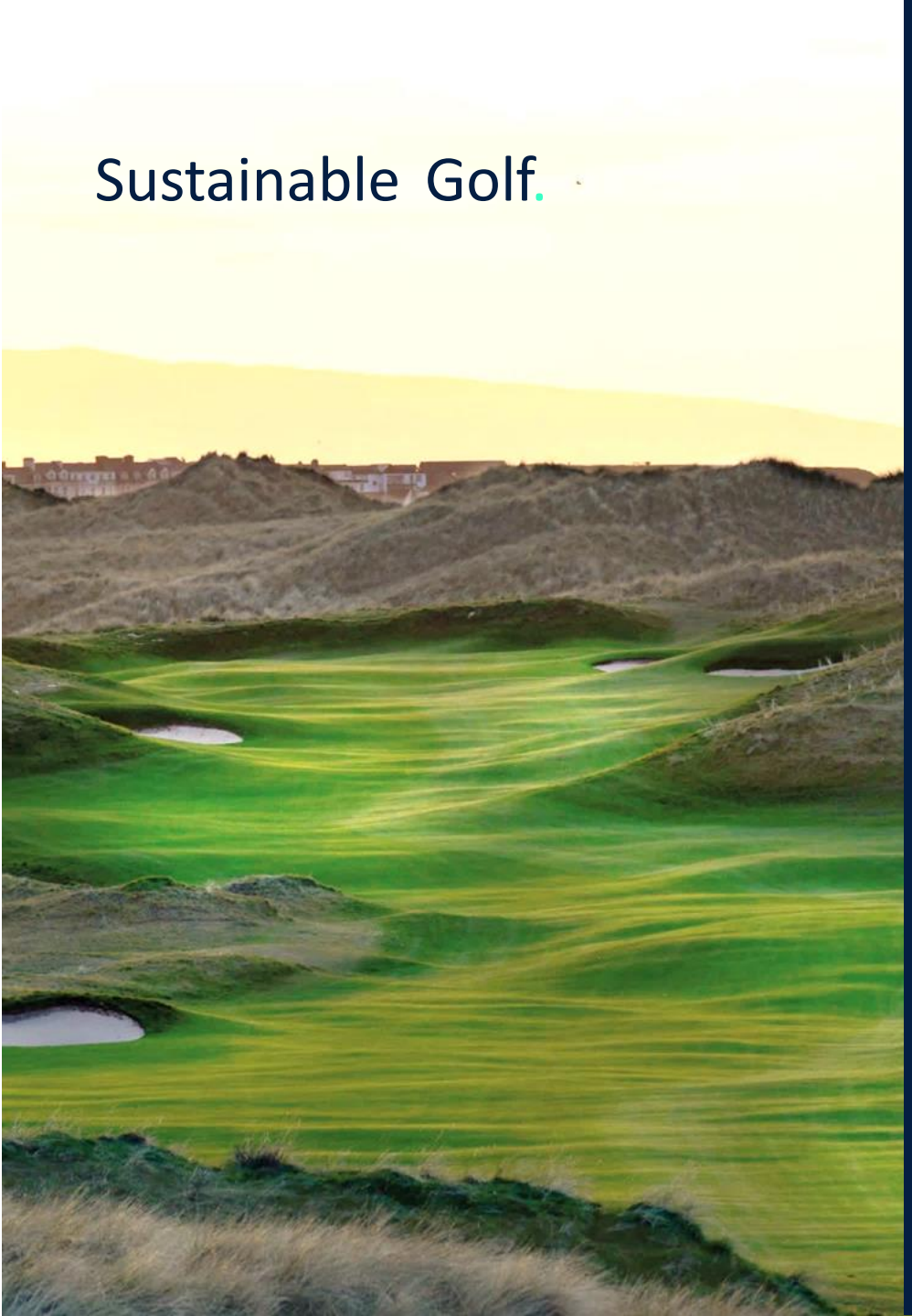
THE OPEN

Authentic
Inspiring
Open

Our world of golf.

Governance and Rules
Heritage
Equipment Standards
Development of the Sport
Professional Championships
Amateur Championships
Sustainability

Sustainable Golf.



GOALS

Raise standards with adoption of practical solutions.

Increase perception of golf as a positive contributor amongst internal and external stakeholders.

APPROACH

- Protect golf with focus on sustainable agronomy.
  - > The R&A takes ownership of sustainable agronomy solutions, expertise and standards.
- Promote positive impact of golf in sustainability.
  - > Positively influence legislators and golfers regarding golf's benefits.

SUCCESS IS...

The R&A leveraging the power of its brand, resources and global connections to protect golf courses from climate change and legislative threats.

Positively influencing standards in sustainable agronomy across golf facilities and improving perceptions of golf as a force for good in terms of its impact on nature and resources.

Protecting the Future of Golf

Education: Course superintendents and greenkeepers play an incredibly important part in achieving these sustainability benefits and properly managed golf courses can deliver real advantages to the local environment and those living nearby.

PROTECT GOLF

- Impacts of climate change
- Resource restrictions
- Legislation
- Public opinion
- Political and operational challenges

PROMOTE GOLF

- As a positive force for good
- Resilience and adaptation
- The greenkeeping profession
- Sustainability solutions

RAISE STANDARDS IN SUSTAINABLE AGRONOMY

INNOVATIVE RESEARCH & PRACTICAL GUIDANCE

R&A / Sustainable Agronomy.

GOLF COURSE 2030

Golf Course 2030 Priorities

Sustainable Agronomy

- Integrated Turf Management
- Alternatives to Pesticides
- Course Conditioning & Playability

Climate Action

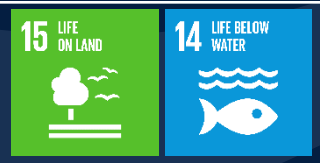
- Carbon Management
- Climate Adaptation

Resource Conservation

- Energy
- Material Consumption
- Waste & Pollution
- Water

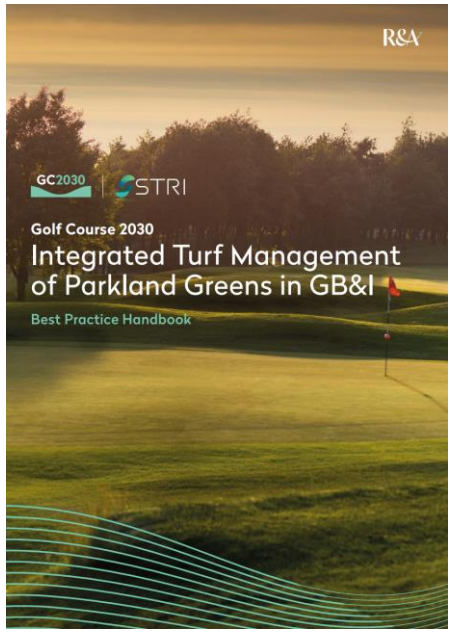
Biodiversity

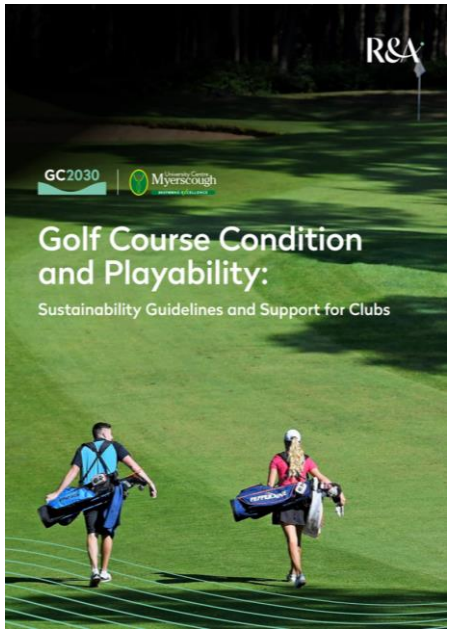
- Natural Value
- Conservation & Protection

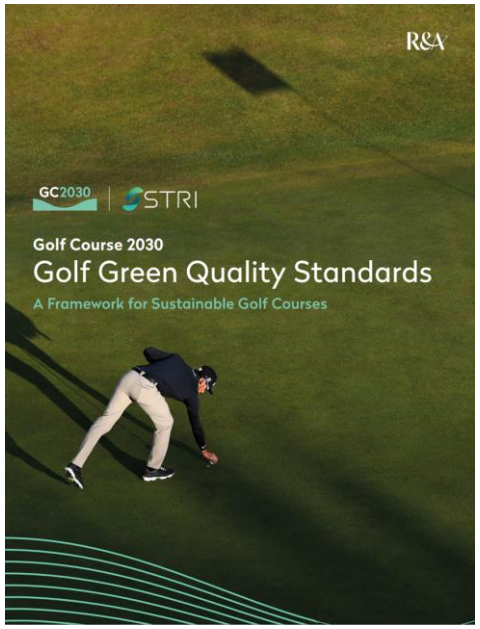


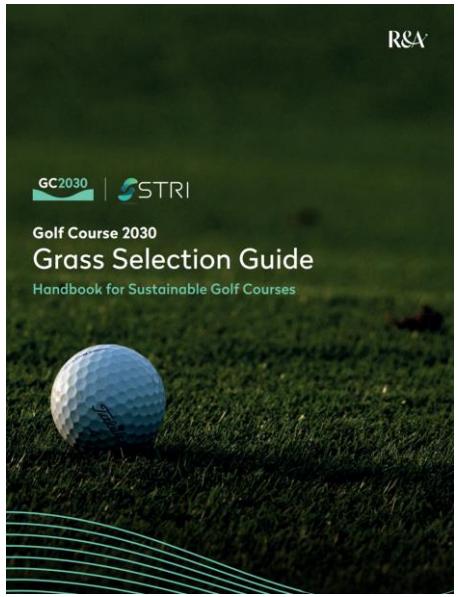
Partnerships

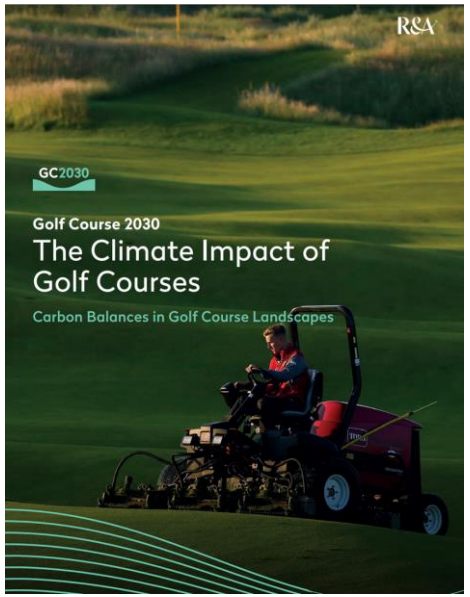
- Planning & Monitoring
- Communicating
- Education & Professionalism

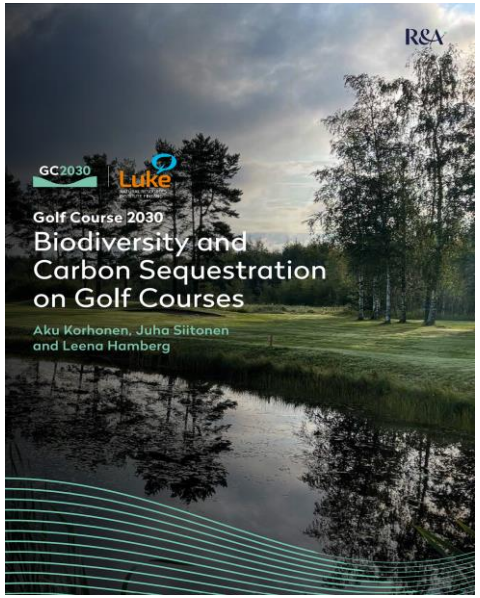




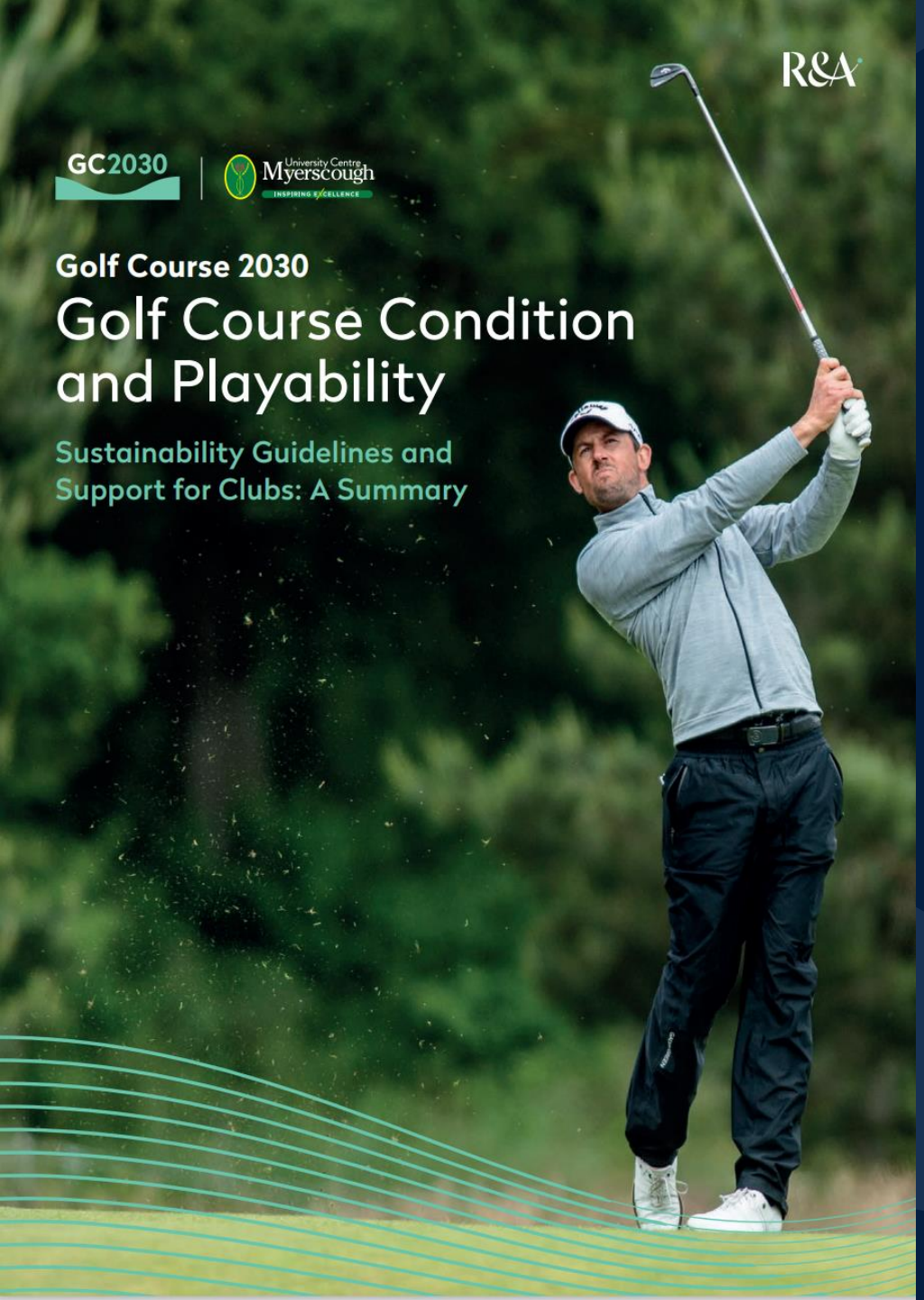








https://www.randa.org/golf-course-2030-projects



GOLF COURSE 2030.

R&A

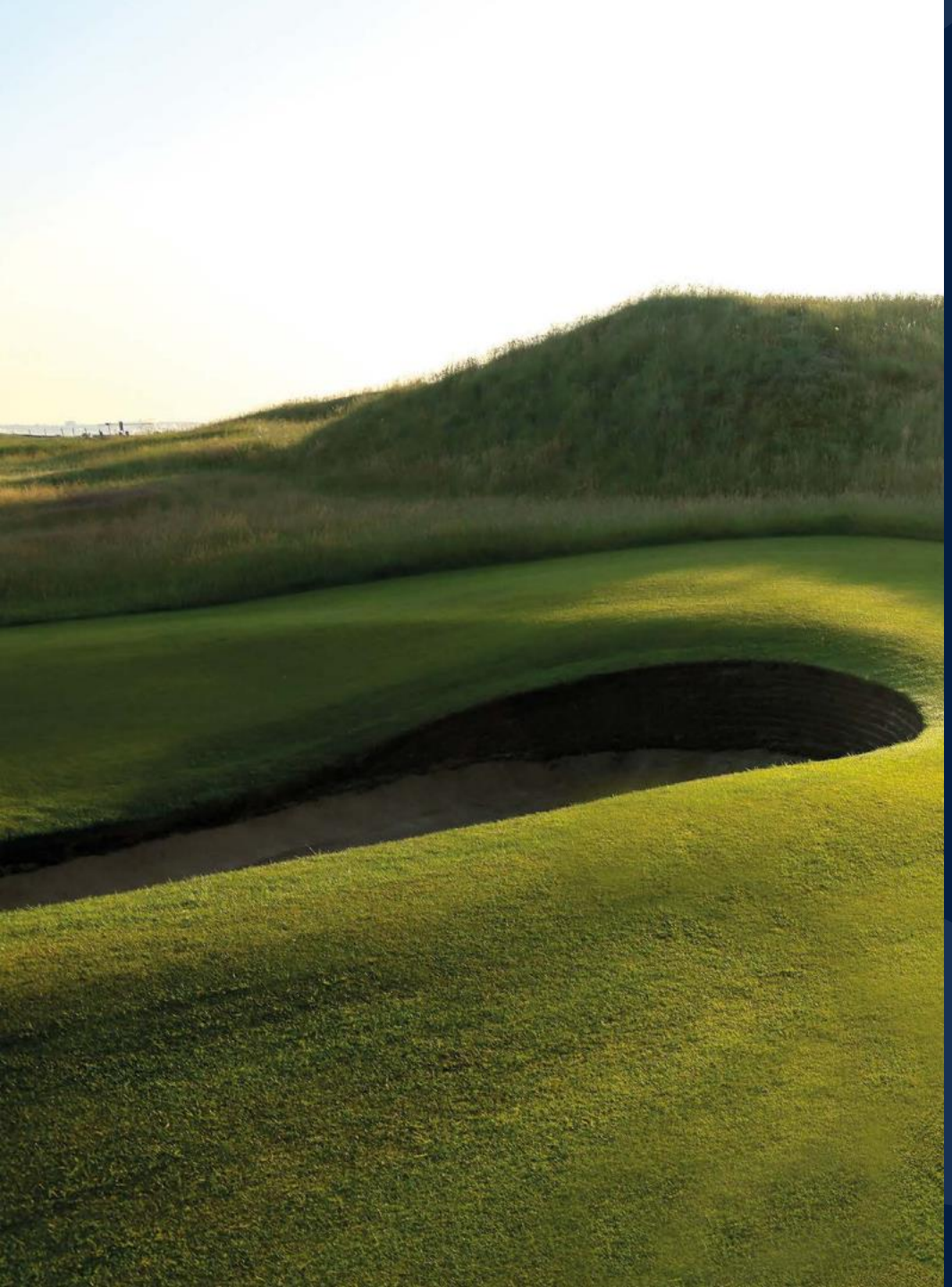
GOLF COURSE 2030.

R&A

Golf club self-assessment: Establishing what ‘quality’ means

Identifying core market and aligning the golf product

GOLF COURSE 2030.

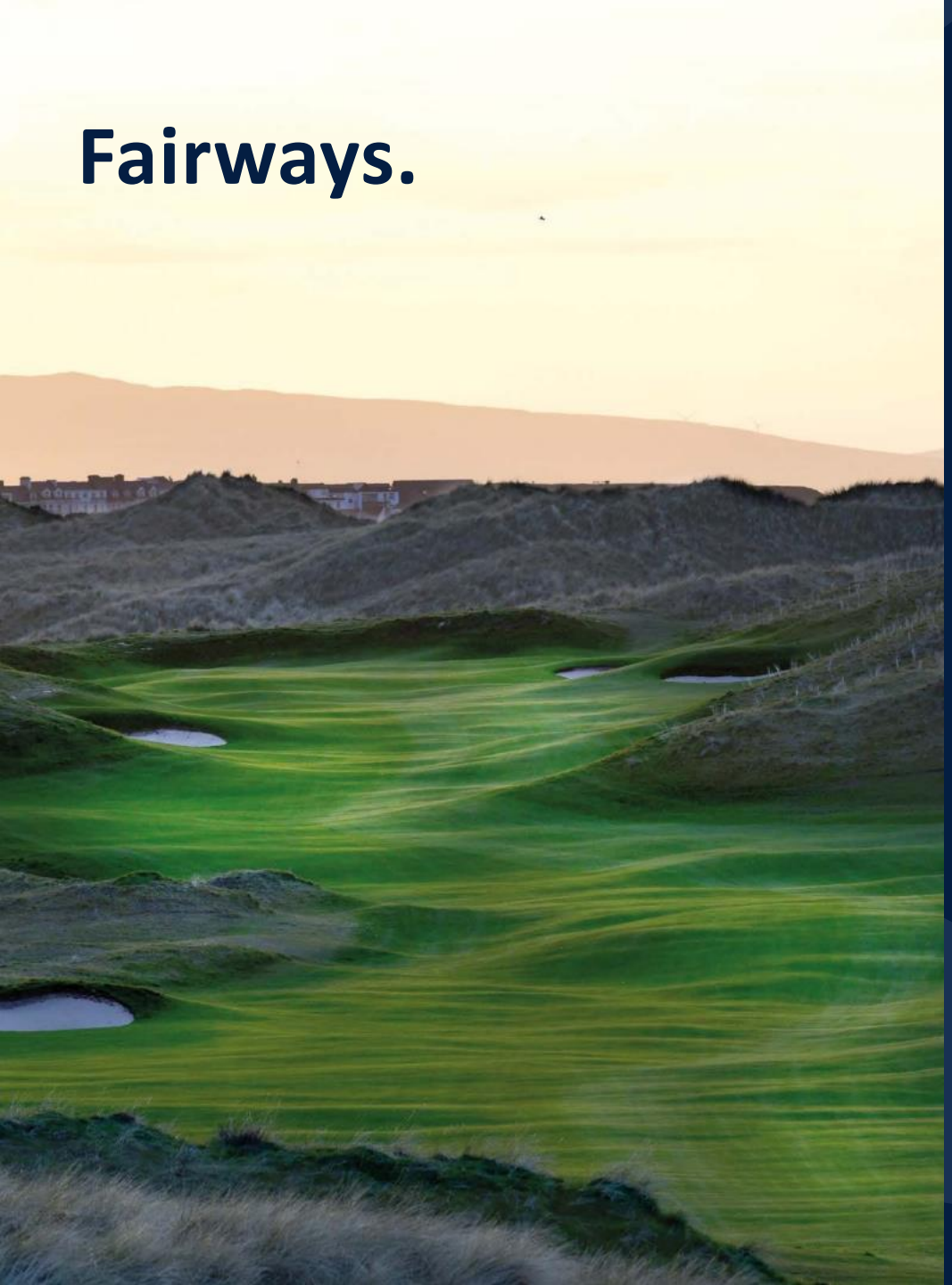


Golf Course Maintenance Performance Brief

The Golf Course Maintenance Performance Brief sets out the Club's quality standards

- Green Speeds relative to the seasons, slopes, turf-type, budget and resources.
- Fairway & Rough presentation – Relative to the prevailing weather conditions and seasons

Fairways.



QUALITY CONSIDERATIONS	
Firmness	• Impact on player stance and ball lie • Impact on ball reaction upon landing – amount of travel on ball roll
Drainage/ Moisture	• Free draining – particularly on problem areas/holes • All year round play
Aesthetic appearance	• Definition between fairway and rough areas • Uniformity between fairways • Golfer perception of presentation • Psychology of presentation and design from tee
Grass cover	• Grass species and tolerance for wear/damage and mowing height • Golfer perception and visual appeal • Impact on club and ball interaction – quality of strike / spin rate
Grass height	• Grass species and tolerance • Impact on ball lie and ability to execute preferred shot
Width	• Impact on style of play due to size of target landing area • Visual and psychological impact on approaching the tee shot.
Freedom from weeds, pests, and diseases	• Impact on grass growth and aesthetic appearance • Maintenance input considerations

FAIRWAY WIDTH AND SKILL LEVEL CONSIDERATIONS		
Narrow	Under 30 yards (28 metres)	Suitable for higher skill levels – professional golfers and those with low handicaps
Medium	35–45 yards (32–42 metres)	Suitable for most players – allows for competitive and strategic play
Wide	More than 45 yards (42 metres)	Suitable for lower skill levels – players without handicaps and 'family play' courses

GC2030 | STRI

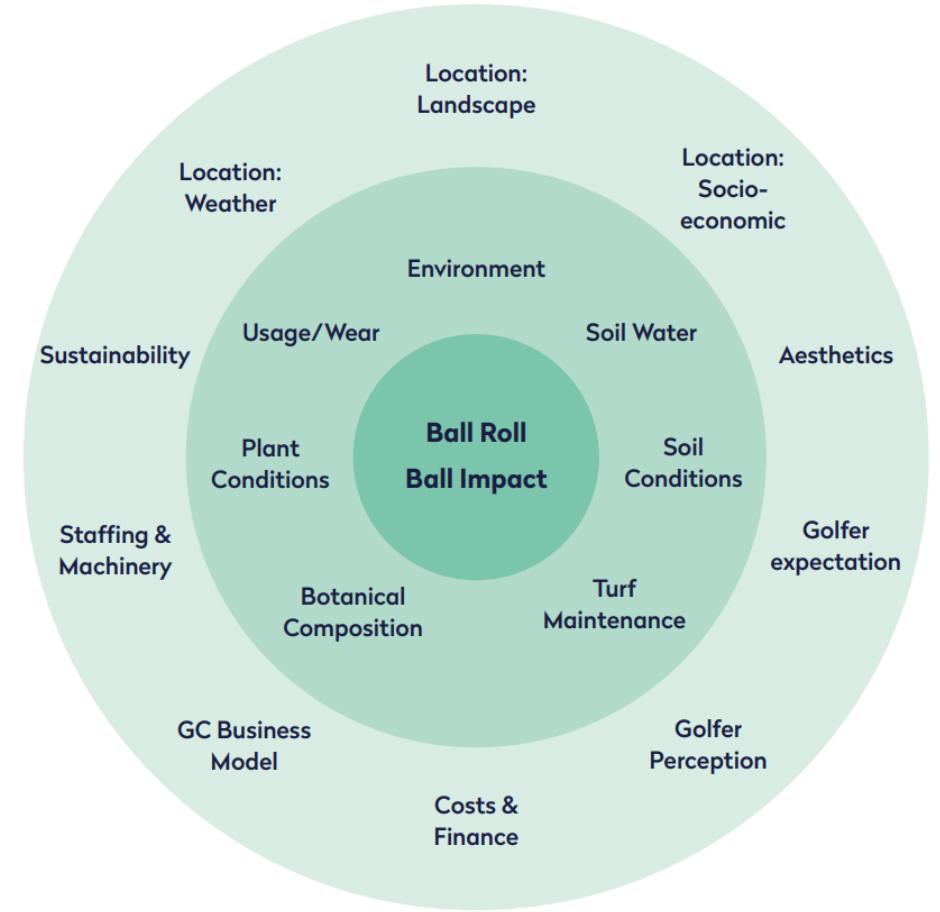
Golf Course 2030

Golf Green Quality Standards

A Framework for Sustainable Golf Courses

GOLF COURSE 2030.

Golf Green Quality Framework.



Key surface performance characteristics

Factors that have a direct effect on surface performance

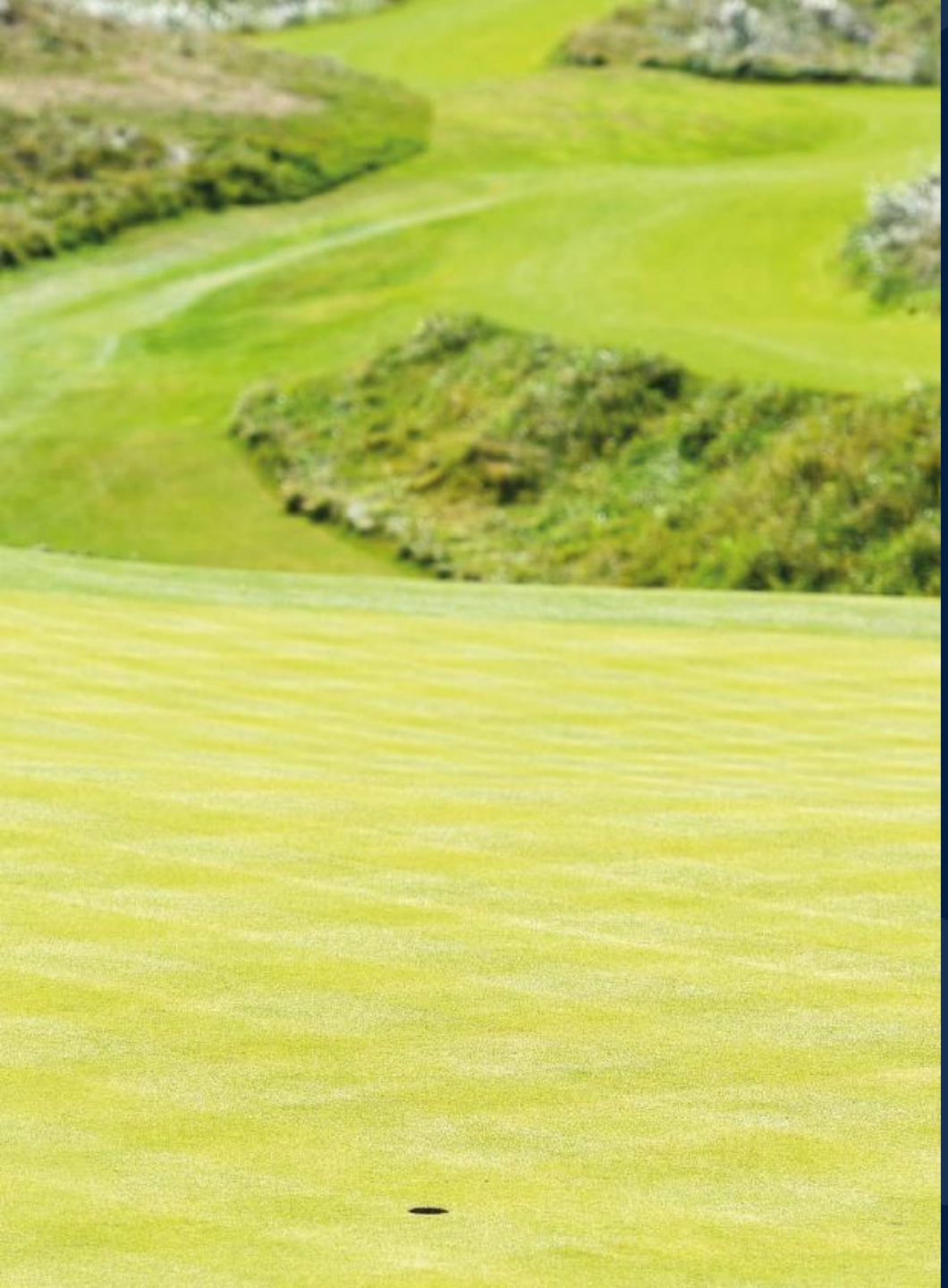
Important factors affect surface performance but maybe less directly

Greens Quality Standards

Characteristics under assessment	Tools	Agronomic or playing quality specific tools
Ball roll (distance rolled)	• Stimpmeter • Peltzmeter • Lodge Ramp • Greenstester	Playing quality tools
Ball roll (evenness and geometry of roll)	• STRI Trueness meter • Holing out Test • Parrymeter • Visual rating of ball movement (word pictures) • Ball spread tests (distance between balls)	Playing quality tools
Ball impact	• Fieldscout Trufirm • Clegg Soil Impact Hammer • Ball impact firmness meter	Playing quality tools
Soil profile	• Round corers • Rectangular profile corers • Knife (to take cake wedge)	Agronomic assessment
Soil organic matter	• Ruler and corer to measure thatch depth • Laboratory measure (loss on ignition or wet oxidation)	Agronomic assessment but with a strong influence over playing quality

Greens Quality Standards

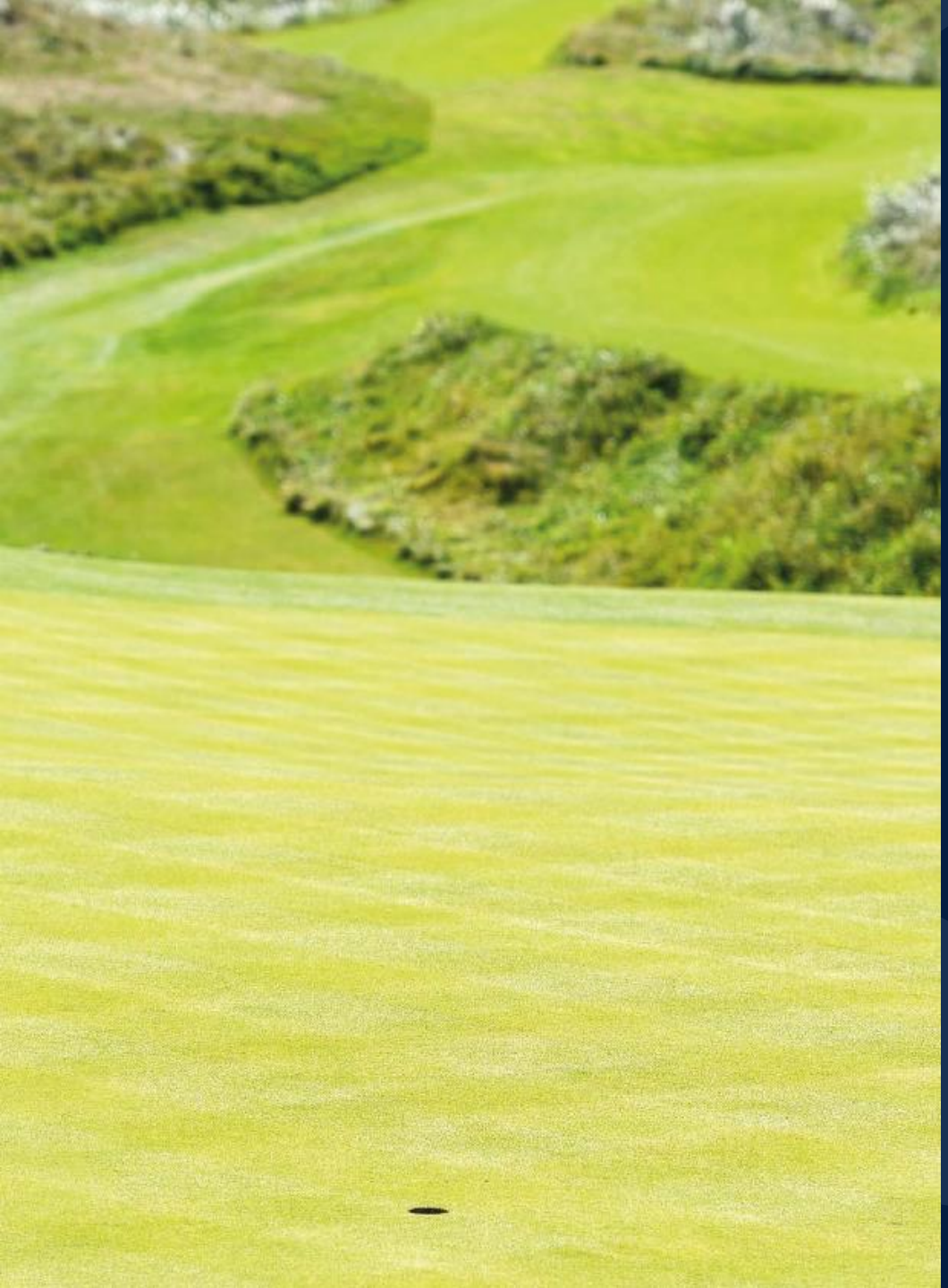
Characteristics under assessment	Tools	Agronomic or playing quality specific tools
Soil drainage (infiltration)	• Infiltrometers • Disc permeameter	Agronomic assessment but with a strong influence over playing quality
Soil compaction	• A wide range of penetrometers that work on either impact with the surface or impact on a probe being pushed into the surface or the operator pushing a probe into the surface.	Agronomic assessment but with a strong influence over playing quality
Soil water content	• Wide range of digital probes using TDR technology or similar such as Delta-T Theta probe or Stevens Pogo or Spectrum TDR200/300 • Laboratory measured on soil cores	Agronomic assessment but with a strong influence over playing quality
Turf colour/health	• Visual observation • Colour charts • NDVI or colour meters	Agronomic assessment
Sward height	• Prism gauge • Height disc or gauge	Agronomic assessment
Sward composition	• Visual estimation • Frame quadrat methods • Point quadrat methods	Agronomic assessment with this characteristic influencing playing quality



Greens Standards

How the tailored green standards will be used at each course will depend on the club's objectives and could include the following:

- To assess the day to day playing quality of greens
- To establish changes in green performance over time
- To inform maintenance decisions based on green condition and quality
- To highlight problem areas on greens and the extent of the problem
- To provide information on the underlying causes of green performance issues

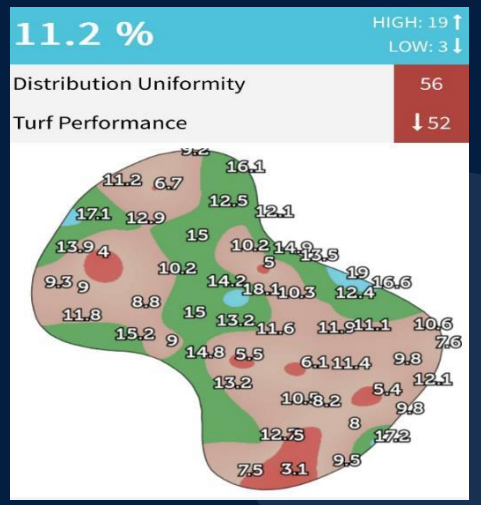


Greens Standards

How the tailored green standards will be used at each course will depend on the club's objectives and could include the following:

- To assess the resilience of green quality due to various factors such as seasonality, adverse or extreme weather, climate change etc.
- To monitor progress of improvement programmes and allow works to be adjusted
- To establish if there is a need (due to construction for example) to have seasonal standards that reflect what "good quality" looks like in winter/ wet season as well as the main playing season.

Data Collection

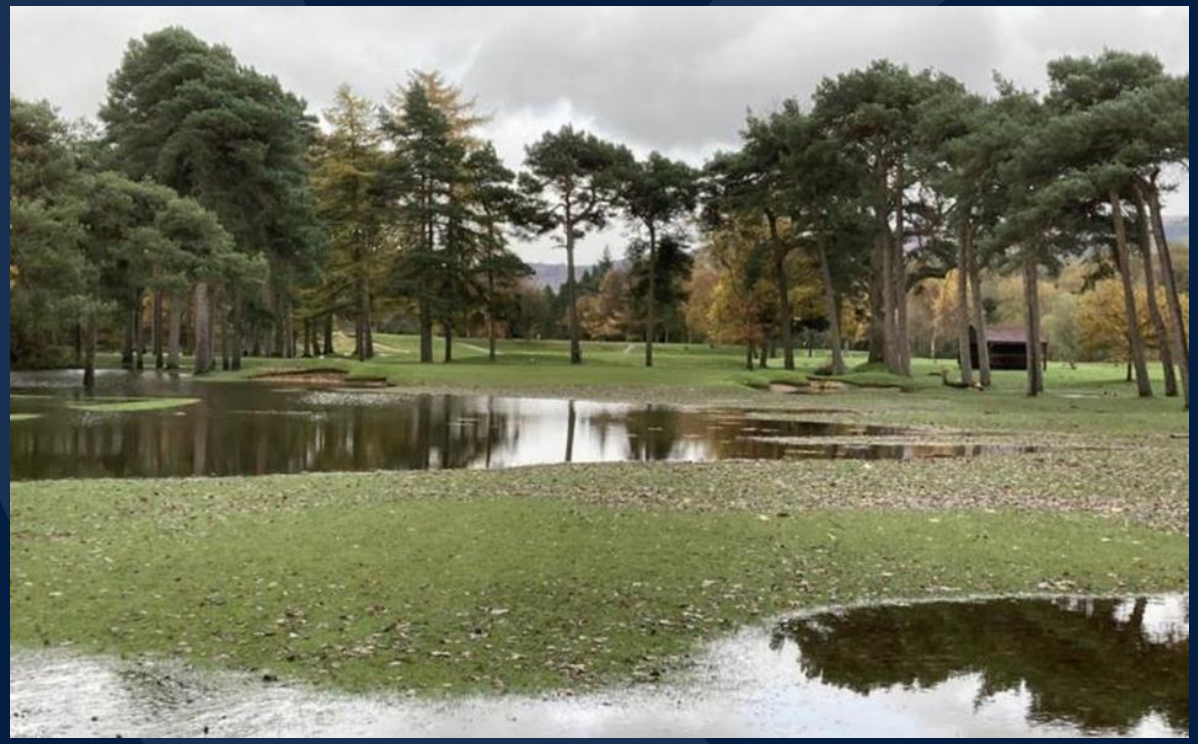


Adopt **SUSTAINABLE AGRONOMY** practices.

Responsible **RESOURCE** management.

Promote **BIODIVERSITY** in golf.

Take **CLIMATE** action.



Golf Course Carbon Cycle (Bekken, 2024)

Estimating carbon emissions

Emissions Category	Scope 1	Scope 2	Scope 3
Electricity 		Carbon emissions from the generation of grid electricity in the UK that is used	Carbon emissions of electricity that is lost during the transmission and distribution of electricity
Fertiliser 	Emissions from denitrification of nitrogen fertilisers after application.		Carbon emissions from the manufacturing of nitrogen, phosphorus, and potassium fertilisers.
Fuel 	Carbon emissions from the combustion of all fuels at MGC. This includes fuels to power all machinery and heat the maintenance facility.		Carbon emissions from the manufacturing of fuels used
Machinery 			Carbon emissions from the manufacturing, transport and repair of machinery
Pesticide 			Carbon emissions from the manufacturing of herbicides, insecticides, and fungicides used
Sand 			Carbon emissions from the mining and transport of sand to the facility.

To calculate the carbon balance, we calculate the carbon emissions of the golf course maintenance activities using the model presented in Bekken and Soldat (2021) and which was developed collaboratively with GEO Foundation.

This model calculates carbon emissions from golf course maintenance activities and does not estimate emissions from the clubhouse or other facilities at the golf course.

The model includes emissions from the maintenance equipment, maintenance facility, and the irrigation pump.

The model estimates Scope 1, 2, and 3 emissions.

Emissions.

Burning of fossil fuels emits
carbon dioxide to the atmosphere

Carbon emissions are the processes by which carbon is released to the atmosphere.

Combustion of fossil fuels is the most common process that emits GHGs to the atmosphere and involves reacting oxygen and hydrocarbons (i.e., petrol, diesel, natural gas etc.) to produce carbon dioxide and water.

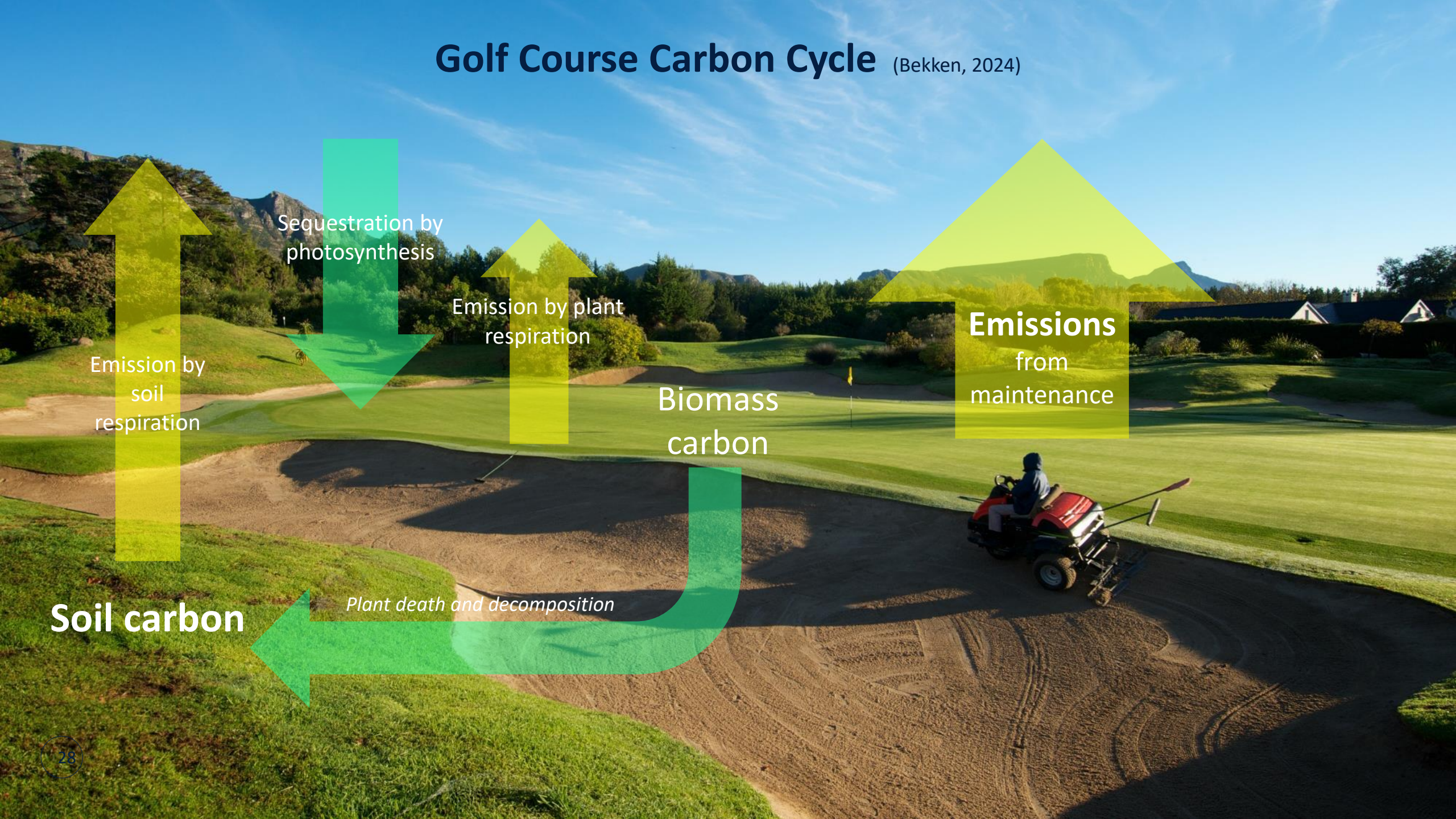
Sequestration.

Photosynthesis removes
carbon dioxide from the atmosphere

Conversely, carbon sequestration is the process by which carbon is taken out of the atmosphere.

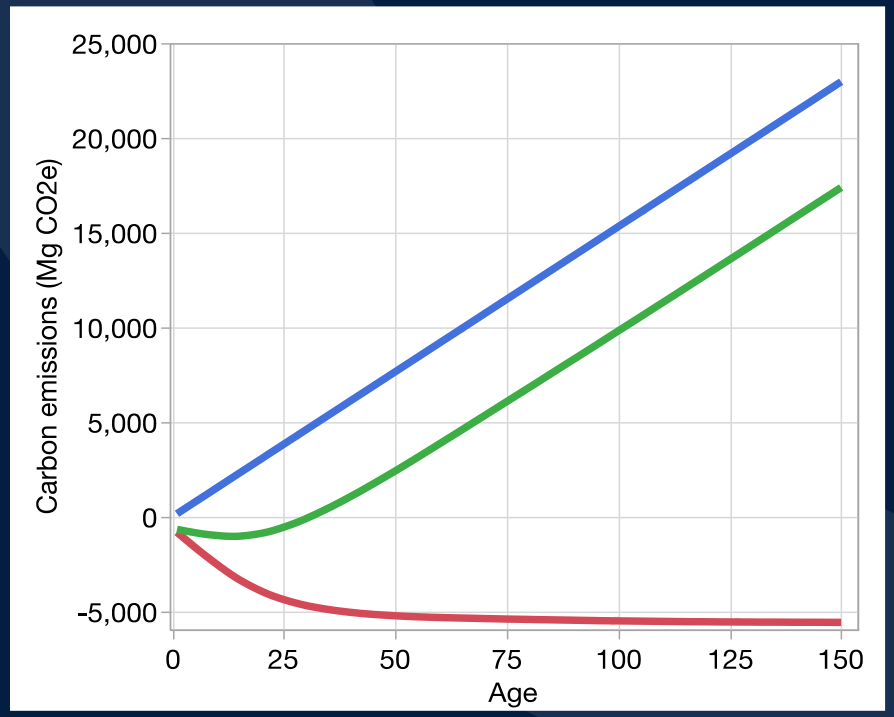
Photosynthesis by plants removes carbon dioxide from the atmosphere and through a complex series of chemical reactions is able to produce sugars and oxygen. The plant retains the sugars and releases the oxygen back to the atmosphere.

Golf Course Carbon Cycle (Bekken, 2024)

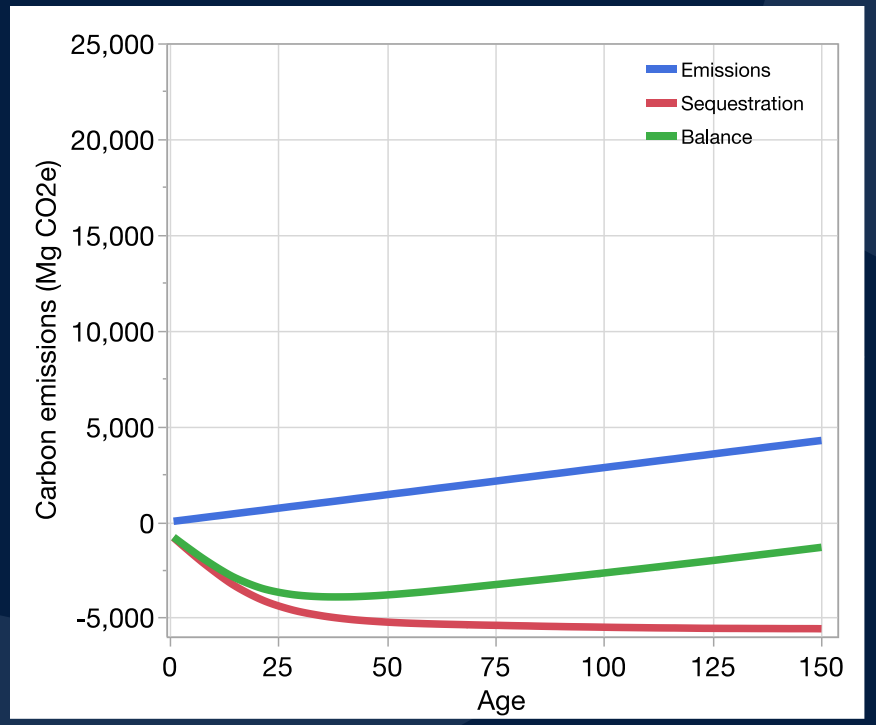


Emissions levels need to be reduced by over 4 times from current levels for golf courses to be carbon neutral over their lifecycle

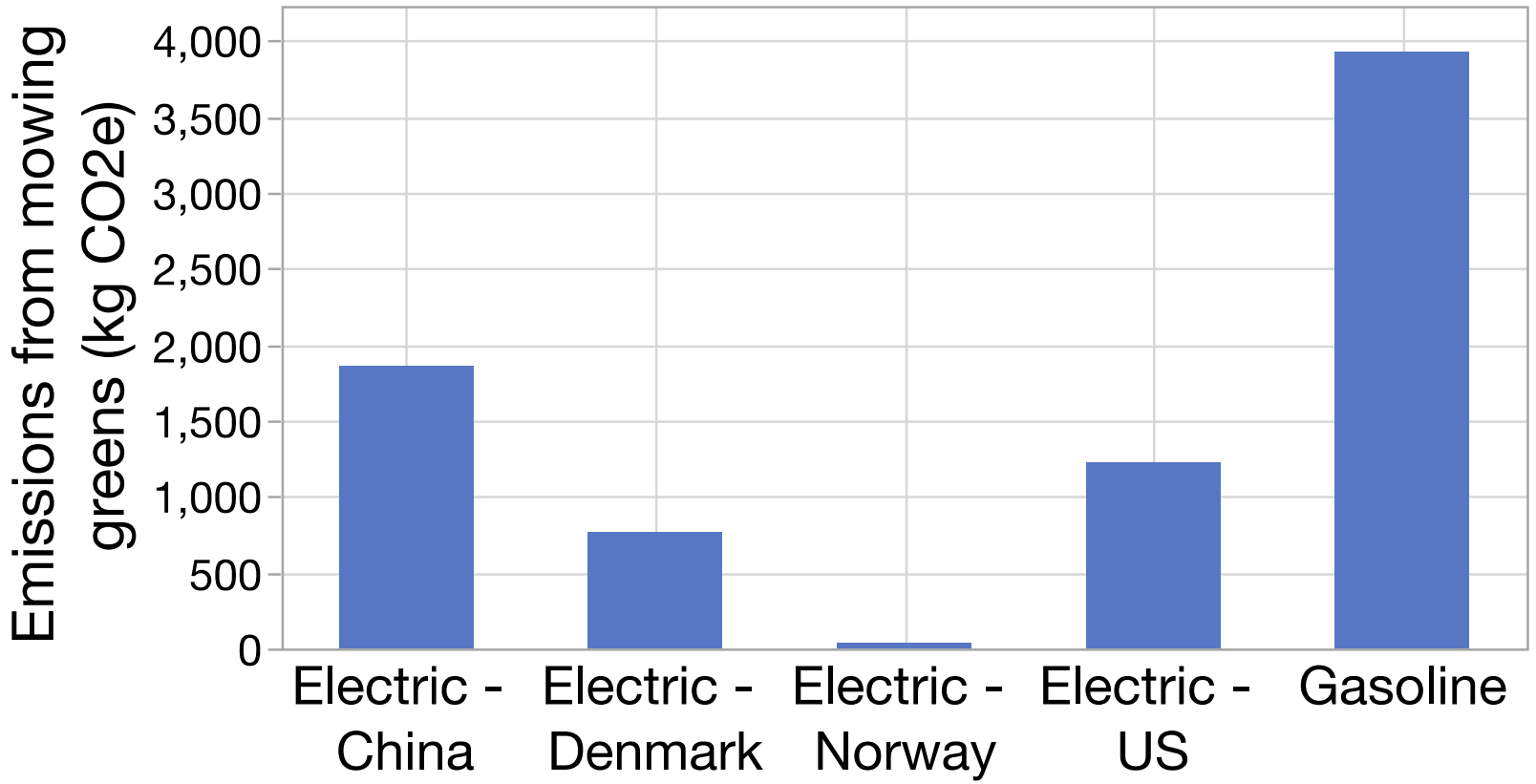
Current trajectory



To be carbon neutral



Electrification reduces emissions regardless of how electricity is produced



Hypothetical scenario

Gasoline (Petrol) vs electric triplex greens mower

Mowing greens for 1 year

200 greens mowing events

1.2 ha of greens

Climate Action Priorities.

- Electrify Maintenance Equipment

  As far as possible, and source low-carbon electricity.

- Resource Efficiency

  Minimise use of water, topdressing (offsite), fertiliser and pesticides.

- Measure Sequestration

  Direct measurement of turfgrass areas to provide accurate benchmark.