

Net Zero Roadmap

Ranhill Utilities Berhad



Ranhill



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Forward-Looking Statements Disclaimer

Any forward-looking statements such as targets, future plans, operations, and forecast figures is based on reasonable current assumptions. Readers are advised not to place undue reliance on such statements as our business is subject to risks and uncertainties beyond Ranhill's control. Actual results may differ.

About Ranhill Utilities Berhad

Ranhill Utilities Berhad (Ranhill) quest to be a regional leader in Water, Wastewater, and Energy with emphasis on circular economy. Ranhill comprises three business sectors: Environment, Energy, and Engineering Services.

Ranhill's Environment sector provides a complete "Source-to-Tap" solution for the abstraction, treatment, and supply of raw potable water. This includes provision of technical services in the management and optimisation of water utility assets. Ranhill's Environment Division provides treated water supply in the Johor State, and operates water, wastewater and reclaimed water treatment plants in Johor, Thailand and China. The Division also provides technical services in the management and optimisation of water utility assets as well as Non-Revenue Water (NRW) management.

Ranhill's Energy Division consists of the development, ownership, operation and maintenance of two (2) Combined Cycle Gas Turbine (CCGT) power plants and a 50 MWac solar farm secured in the LSS4 tender exercise.

Engineering Services sector comprises several companies that provide services on (i) network management and NRW reduction (ii) solutions provider, and O&M for potable water, wastewater, and reclaimed water treatment (iii) engineering, PMC, EPCM and MMO of infrastructure energy, chemical and resource sectors (iv) operations and maintenance arms of CCGT power plants.

About This Document

This Net Zero 2050 Roadmap document outlines the Ranhill Net Zero Transition Plan. Its purpose is to provide our stakeholders with clarity about the actions the company intends to undertake to realise our Net Zero 2050 aspiration, including our strategies and targets moving forward

EXECUTIVE SUMMARY

This Ranhill Net Zero 2050 Roadmap outlined our transition plan - targets, strategies and actions - towards low carbon and reaching a state of net zero emissions by 2050. It pertains nine major subsidiaries in Malaysia under the Energy and Water business with total emission of 1,932,031 tCO₂eq during its base year of 2022. Scope 1 and Scope 2 GHG emissions contributed 82.9 percent of Ranhill’s emission which mainly came from gas-fired power plants subsidiaries (RSE I and RSE II) and Ranhill SAJ as depicted in diagram below.

By 2050, we aim for a 90 percent reduction on Scope 1 and Scope 2 emission level compared to 2022 level, with the remaining residual to be neutralised by carbon removal or offsets. Our approach also extends to Scope 3 emissions, where we are dedicated to measuring and reducing our environmental footprint comprehensively. All seven (7) greenhouse gases will be addressed in this roadmap, ensuring a comprehensive coverage.

As for short-term targets, by 2030, Ranhill is committed to a 25 percent reduction in emissions per electricity generated in our Energy Business and a 30 percent emissions reduction in our Water Business. These two businesses contributed 99.6 percent of the group’s total emissions.

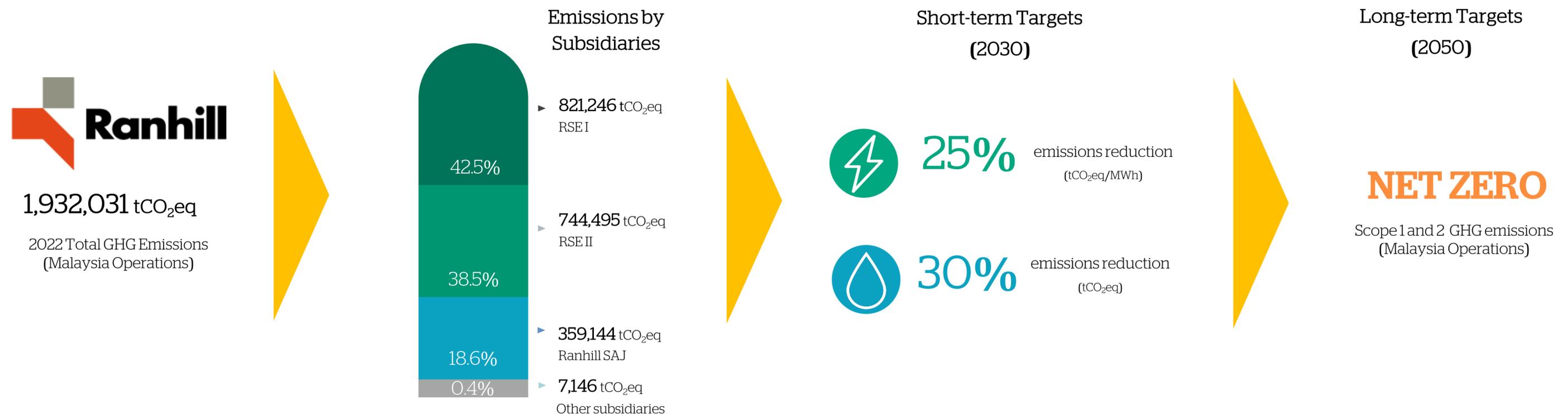
The energy business will pivot to focus on renewable by expanding our portfolio of utility-scale solar farms while also explore the potential of geothermal and wind energy. For our combined cycle gas turbine (CCGT) power plants business, we will continue operating with better efficiencies, capable of co-firing, and fitted with carbon capture storage (CCS).

For our water business, we will seek to displace our electricity consumption from the grid with renewable energy sourced via our solar farms while energy efficiency and optimisation of our

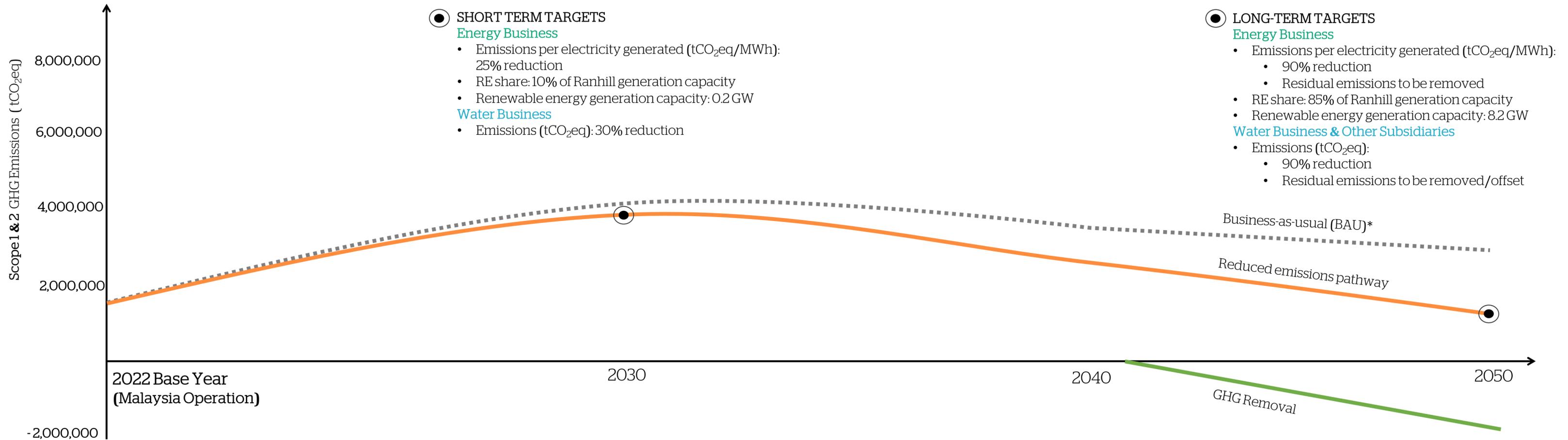
operations will revolve around replacement of less efficient motors as well as pump scheduling regimes respectively for our “Source-to-Tap” operations.

For us to realise our Net Zero targets as a group, holistic strategies that encompasses all our subsidiaries are needed, irrespective of their business nature and operations. Majority of these group-wide initiatives tackles the emissions under Scope 3.

Ranhill Net Zero diagram (next page) summarises the path, target and respective business mitigation strategies. A robust implementation and governance framework is being established to ensure successful implementation under the purview of the Group’s Sustainability Working Committee, assisted by a GHG Management Team.



Ranhill Net Zero Roadmap Summary



ACCELERATE ACTION (2023 - 2030)

SCALING ACTION (2031 - 2040)

(2041 - 2050)

Mitigation Options	ACCELERATE ACTION (2023 - 2030)		SCALING ACTION (2031 - 2040)		(2041 - 2050)	
	Energy Business	Water Business	Energy Business	Water Business	Energy Business	Water Business
	<ul style="list-style-type: none"> Plant Maintenance Performance Optimisation Solar Farm 	<ul style="list-style-type: none"> Equipment Maintenance Process Optimisation Efficient Pump Solar Farm (Self-Consumption) 	<ul style="list-style-type: none"> Co-firing with Hydrogen High-Efficiency Gas Turbine Floating Solar Farm Geothermal 	<ul style="list-style-type: none"> Floating Solar (Self-Consumption) Solar Farm (Self-Consumption) Wind Energy 	<ul style="list-style-type: none"> Carbon Capture New RE Technologies 	<ul style="list-style-type: none"> Low Carbon Water Treatment

- Group-wide Initiatives**
- Decarbonising the Value Chain
 - Leading the Low Carbon Market
 - Normalising Low Carbon Practices
 - GHG Management and Governance
 - Carbon Removals/ Offsets

*Business-as-usual (BAU) is assuming three new CCGT extended the Power Purchase Agreement (PPA) and still operated by Ranhill Utilities Berhad.

01 Commitment to Sustainability

Introduction

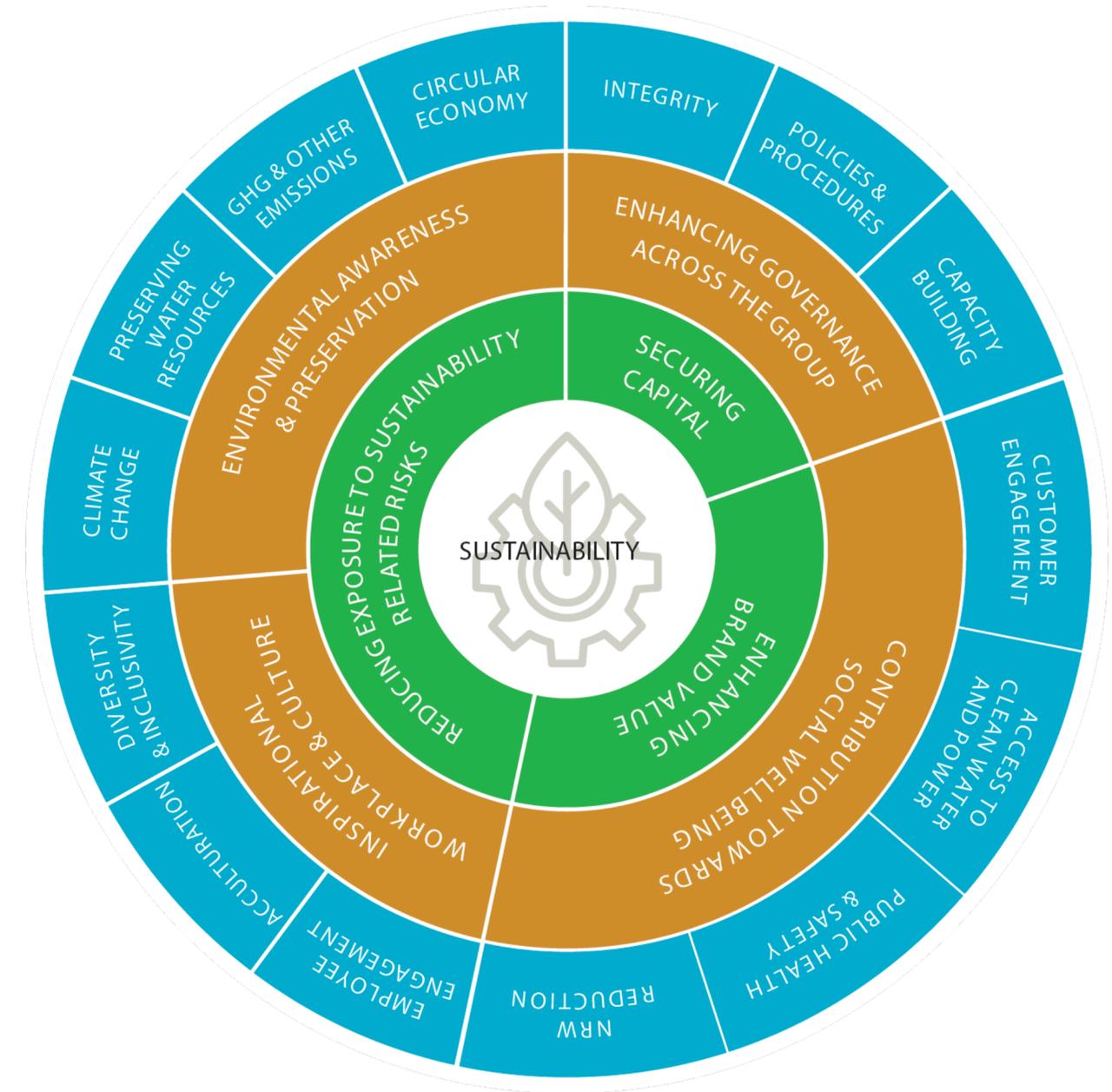
Climate change is the defining challenge of our time. At Ranhill, we believe that strengthening the response to climate change is a global imperative for governments and companies alike. We want to create meaningful value and positive impact in that regard and are fully cognisant of our corporate responsibility and within our operations, we continue to take stock of our environmental impact.

Addressing the sustainability challenge requires commitment and determination. With the board and senior management providing steer, we are continuously integrating sustainability considerations into our operations. We are committed to bringing everyone along - employees, customers and suppliers, and working more closely than ever with policymakers and the communities in which we operate to make a difference. Thus, through our operations, we go beyond the realisation of pure revenue and profits. Most importantly, we are working to build a mindset which includes sustainability as a lens to view all business activities and decisions.

Accordingly, in line with our vision to be a regional leader in Water, Wastewater and Energy with emphasis on circular economy, while growth in financial performance remains a fundamental aspect of the Ranhill business model, sustainable development performance has become an intrinsic foundational element of our long-term value proposition as we firmly believe that companies that want to do well must also do good. Therefore, sustainability is at the core of our strategy development which is then embedded into and operationalised by our business units.

With this in mind, in moving our sustainability agenda forward, our approach is driven by four strategic pillars as depicted in diagram. These pillars are as follows and the topic of GHG falls under the first pillar.

1. Environmental Awareness & Preservation
2. Contribution Towards Social Wellbeing
3. Inspirational Workplace & Culture
4. Enhancing Governance Across the Group



Ranhill Four Pillars of Sustainability



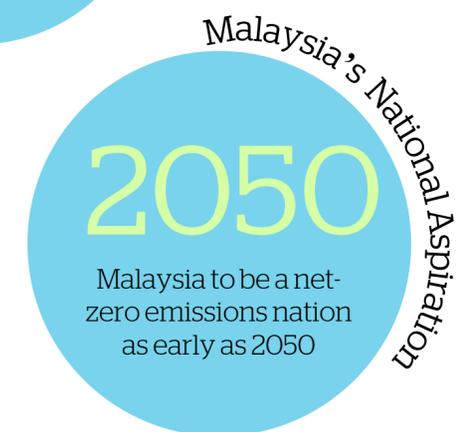
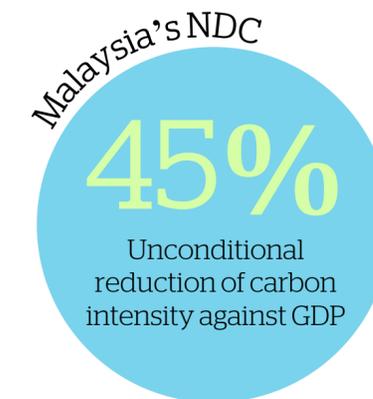
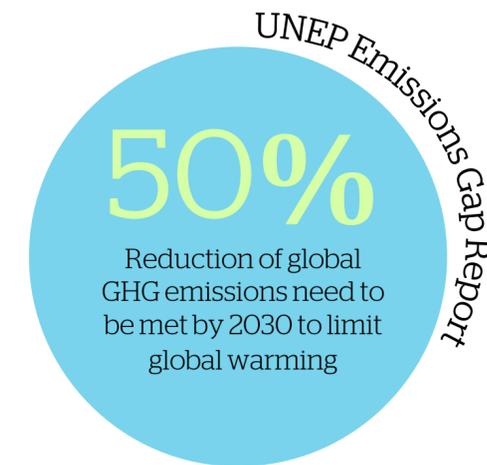
Gunung Pulai Dam
Kulai, Johor

Climate Goals and Sustainability

At the COP26 UN Climate Change Conference in Glasgow, countries reaffirmed the Paris Agreement goal of limiting the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5 °C. Since then, numerous reports have been published outlining the importance of addressing climate change and warning the irreversible effects of failure to control the global average temperature increase.

With the crucial year of 2030 looming ever closer, many countries have enhanced their Nationally Determined Contribution (NDC) submissions to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat and Malaysia is no exception. Under its revised NDC submitted in 2022, our country has reinforced its mitigation ambitions with an unconditional target to reduce carbon intensity against GDP by 45 percent by 2030 compared to 2005 levels and extend coverage to seven GHGs.

This strengthened response to climate change is underscored by the government’s unveiling of the National Energy Transition Roadmap (NETR, 2023), which will serve to guide the nation as it navigates the complex journey towards realizing its net zero aspiration as early as 2050, which requires a whole-of-nation approach involving the government, industry and the general public. As a responsible corporate citizen, Ranhill has ensured that our pathway to sustainability as defined in our Net Zero Roadmap is aligned with the National Aspiration.



Ranhill’s Net Zero Commitment

We believe that it is our responsibility to build a sustainable future for generations to come. In 2022, we have committed to establish a comprehensive GHG baseline and roadmap towards net zero for Ranhill’s operations.

Establishing a clear baseline of GHG emissions will enable the Group to then develop a clear pathway, comprising interim targets and comprehensive strategies to realise that goal. In developing our climate goals commitment, we emphasised alignment with the National Aspiration and adherence to international best practices. Furthermore, we realise that the years leading up to 2030 will be crucial if we want to avoid being locked into potentially irreversible and catastrophic climate transformations.

Collectively, these efforts have resulted in short-term interim climate commitments up to the year 2030 and the ultimate long-term Net Zero 2050 goal, with the interim targets serving as the foundation and as important milestones in the roadmap to our long-term net zero aspiration. In this way, the long-term net zero pathway starts with an actionable, proven, well-defined plan, while at the same time maintaining strategic flexibility and adaptability to accommodate economically and technologically viable solutions as they become available in the decarbonisation landscape.



- 🎯 Interim climate commitments up to year 2030
- 🎯 Long-term Net Zero 2050 goal

“... the long-term net zero pathway starts with an actionable, proven, well-defined plan ... maintaining strategic flexibility and adaptability ...”



Pontian Dam
Pontian, Johor

02 Ranhill Net Zero Plan

Ranhill Net Zero Boundary

The Net Zero 2050 Roadmap covers the business operations and activities in Malaysia of the 9 subsidiaries related to the energy and water business (as listed on the right).

This Roadmap exclude outsourced activities and operations of joint venture companies that Ranhill does not have management control of.



Ranhill SAJ Sdn Bhd (Ranhill SAJ)

Ranhill SAJ undertakes raw water abstraction, treatment, distribution, sale and operates the entire water supply network in Johor. It operates 46 water treatment plants (WTPs) statewide with a total treatment capacity of 2,133 million litres per day (MLD).



Ranhill Water Services Sdn Bhd (RWS)

RWS provides operational, management, construction, and consultancy services to meet the needs of water service providers. They are leaders in the field of non-revenue water (NRW) management, successfully preventing the loss of more than 751 MLD treated water across Malaysia and Riyadh, Saudi Arabia.



Ranhill Water Technologies Sdn Bhd (RWT)

RWT is a provider of water and wastewater treatment technologies with a strong presence in Asia, spearheaded by offices in Malaysia, China and Thailand. Backed by more than 25 years of industry experience, RWT delivers technology-driven projects and services spanning a diverse field of clients ranging from industries, municipalities, industrial parks and water authorities.



Ranhill Sabah Energy I Sdn Bhd (RSE I), Ranhill Sabah Energy II Sdn Bhd (RSE II), Ranhill Sabah Energy O&M I Sdn Bhd (RSEOM I), Ranhill Sabah Energy O&M II Sdn Bhd (RSEOM II)

RSE I and RSE II own and operate two Combined Cycle Gas Turbine (CCGT) power plants in Sabah. RSE II manages the Teluk Salut Power Station while RSE II oversees the Rugading Power Station, each with a generation capacity of 190 MW. RSEOM I and RSEOM II are the operation and maintenance arms of RSE I and RSE II respectively.



Ranhill Solar I Sdn Bhd (RS I)

RS I entrusted with the development, ownership, operation and maintenance of the successfully secured 50MW Large Scale Solar 4 (LSS4) solar farm located in Ladang Bikam, Perak. Construction of the plant commenced in January 2022 with an expected Commercial Operation Date (COD) slated for December 2023.



Ranhill Bersekutu Sdn Bhd (RBSB)

RBSB is a highly experienced engineering consultancy firm that offers a wide range of services. With over 50 years of experience, they have successfully completed more than 2,300 projects in various sectors across Asia, the Middle East, and Africa. RBSB specializes in design, project management, environmental impact assessments (EIA), and engineering, procurement, construction, and commissioning (EPCC) solutions.

Group Emission Profile

We have selected 2022 as the baseline year for this roadmap. For 2022, the Group emitted 1,932,031 tonnes of CO₂eq. Out of this total, 67.8 percent fell under Scope 1, 15.1 percent under Scope 2, with the remaining 17.1 percent under Scope 3.

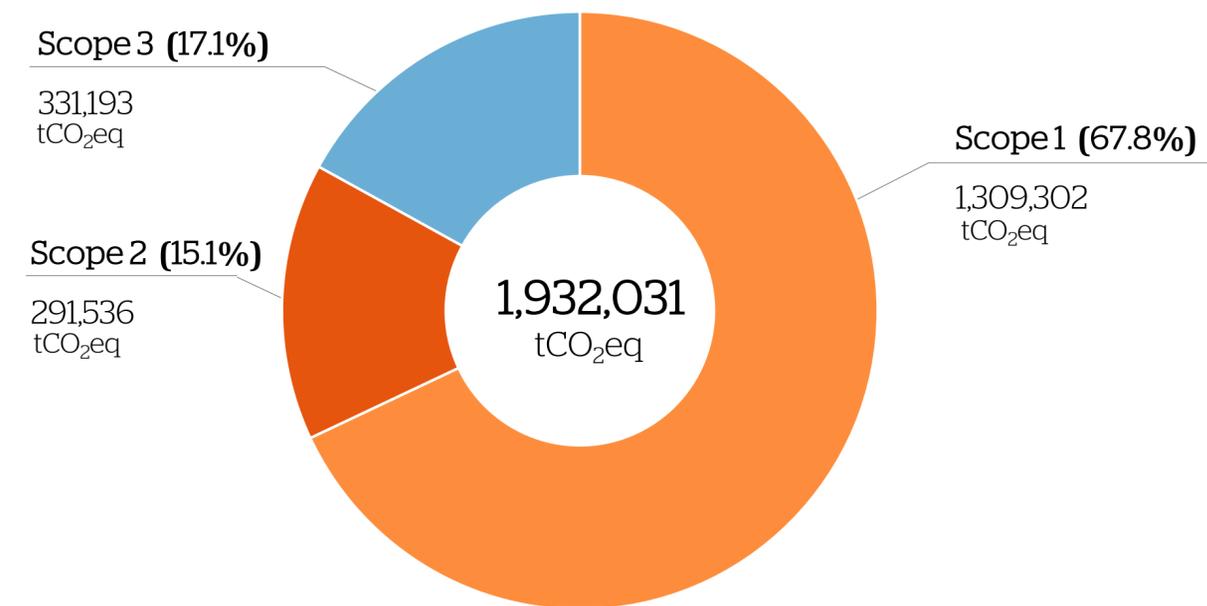
In terms of business segments, the energy and water businesses account for the majority of emissions. Within our energy business, the RSE I and RSE II power plants which operate combined cycle gas turbines contributed 81 percent of our emissions from its natural gas combustion. This makes up the majority of our Scope 1 emissions.

Besides being a power producer, we are also a major power user, with electricity purchased to operate our water treatment plants. This contributes 15 percent of our emissions which also being the major source of our Scope 2 emissions.

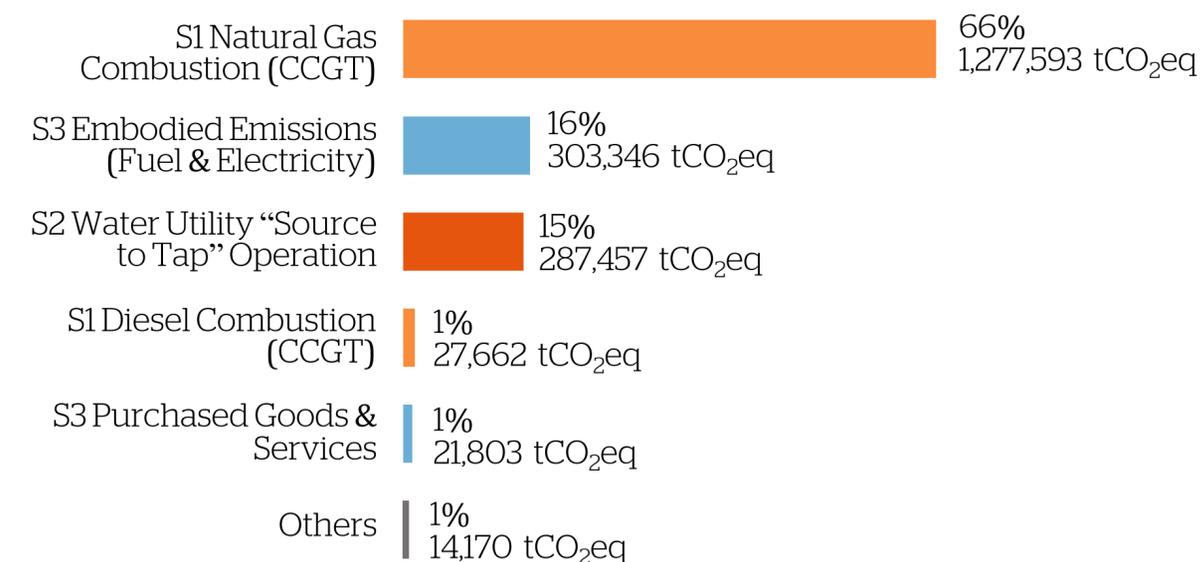
Thus, it is clear that for the Net Zero Roadmap to have the desired impact, there should be a clear focus on the Scopes 1 and 2 emissions that emanate from Ranhill’s energy and water businesses.

Emissions by Scopes

83% of Ranhill’s emission sources are mainly from Scope 1 and 2.

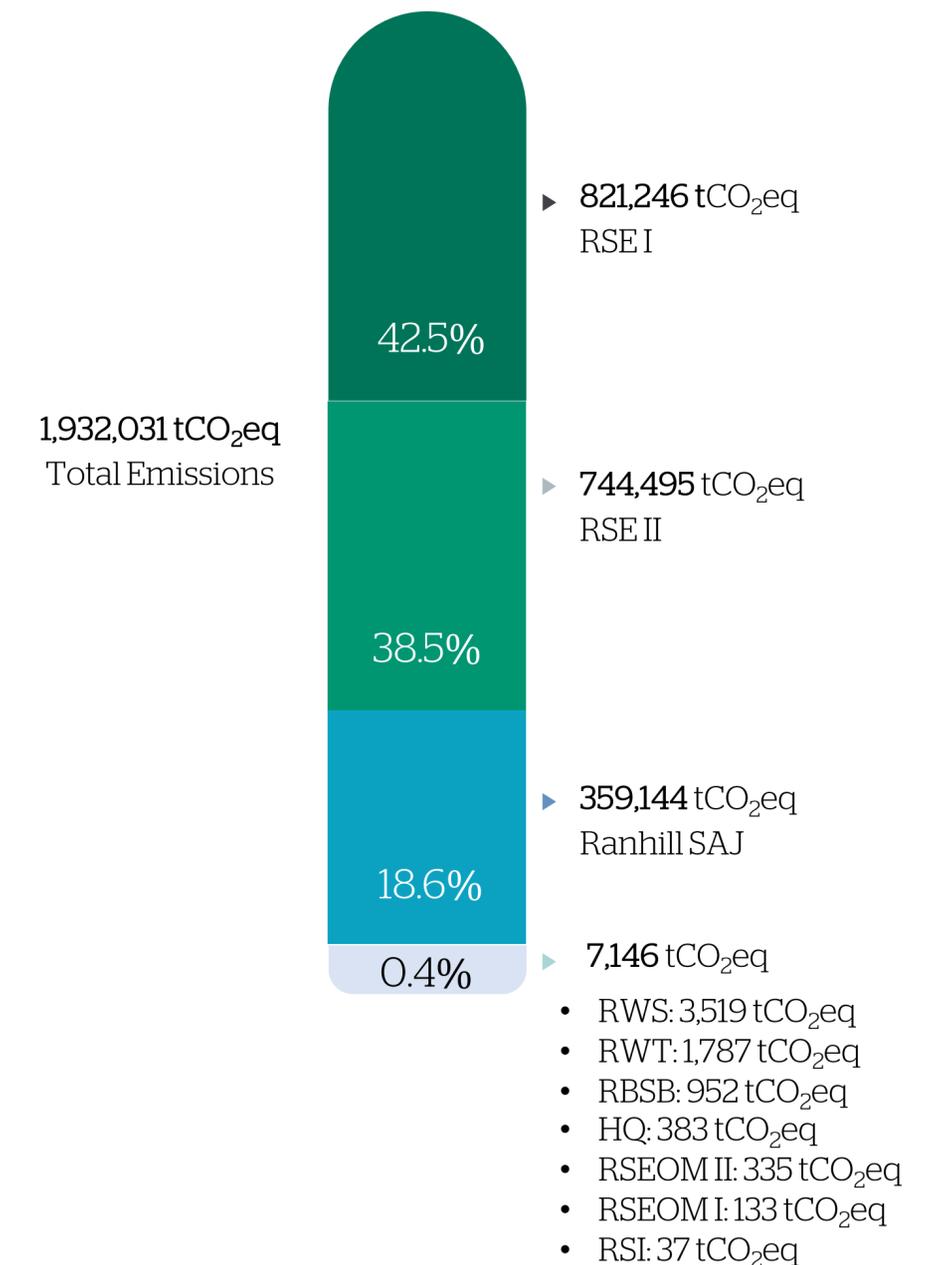


Emissions by Emissions Sources



Emissions by Subsidiaries

Ranhill Sabah Energy I, Ranhill Sabah Energy II, and Ranhill SAJ were the main businesses that contributed to overall Ranhill emissions.

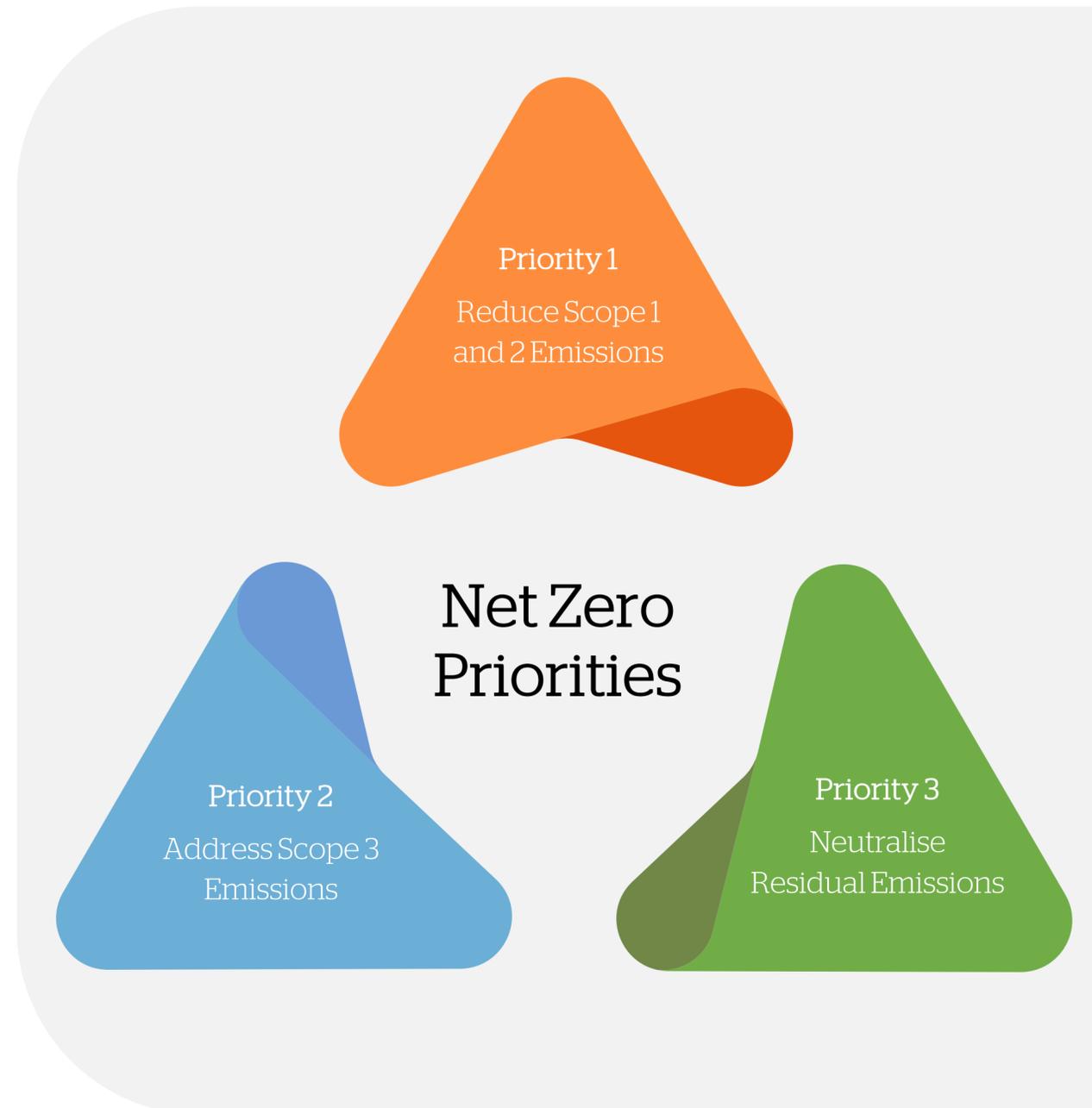


Ranhill Net Zero Approaches and Priorities

The emission profile for Ranhill has made clear the approach needed to reach our Net Zero goal. First is the reduction of our emissions where the GHG emissions will be curbed at source by making meaningful changes to how we operate and harnessing the power of our innovative technology solutions. After all feasible reduction options have been exhausted, we will design a flexible, fit-for-purpose strategy to neutralise the hard-to-abate residual emissions via carbon removals or offsets.

In tackling our emissions, we will be guided by the Net Zero Priorities depicted in the diagram which embodies the development of our business strategies.

Being strategic in crafting our mitigation options towards our Net Zero goals, the selected options will simultaneously position ourselves in the prime position to decarbonise our clients operating in similar areas.



Priority 1: Reduce Scope 1 and 2 emissions

- Set firm targets for Scopes 1 and 2 emissions for 2030 in which we have ownership and control. The interim short-term targets centred around Scope 1 and 2 emission reductions will serve as the foundation and as important milestones in the roadmap to our long-term Net Zero 2050 goal.

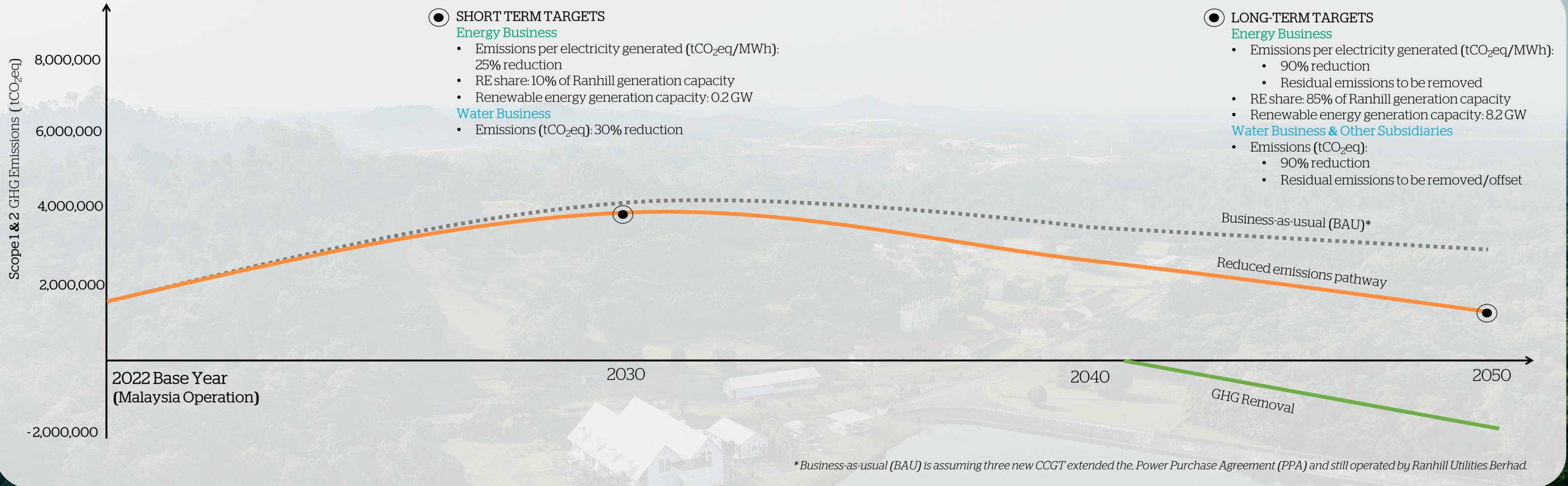
Priority 2: Address Scope 3 emissions

- Take important steps to decarbonise our value chain. While Scope 3 emissions is a complex matter, it is equally important for Ranhill to address. We will assess supplier readiness on emissions reduction and work towards collaborating and having a shared commitment towards the same emissions reduction goal.

Priority 3: Neutralise Residual Emissions

- While achieving our climate targets will primarily be driven by GHG emissions reduction, we recognise that carbon removals/offsets may be required to mitigate some residual hard-to-abate emissions. Ranhill ensures that such neutralisation measures will only be taken once all feasible emission reduction measures are exhausted.

Ranhill Net Zero Pathway



03 Ranhill Net Zero Strategies

25 percent reduction in emissions per electricity generated

Ranhill Net Zero Strategies

In achieving the 90 percent reduction in GHG emission as compared to the base year, Ranhill is guided by three key and mutually-complementing strategies, which are:

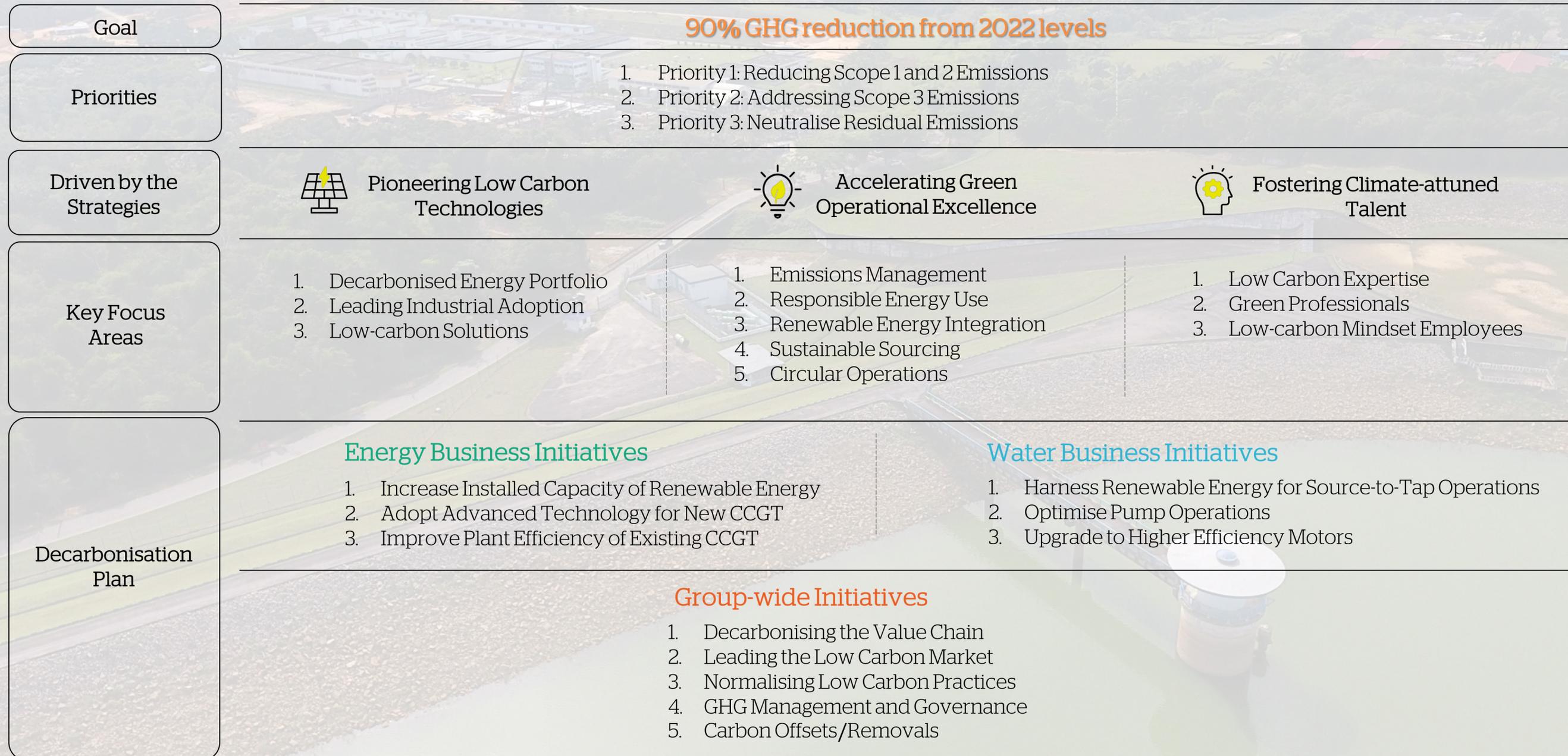
1. Pioneering Low Carbon Technologies
2. Accelerating Green Operational Excellence
3. Fostering Climate-Attuned Talent

This three-pronged strategy and the Net Zero Priorities are translated into eleven focus areas that have been identified as decarbonisation options for Ranhill.

From the three strategies and eleven focus areas, series of initiatives and action plans have been developed as illustrated in diagram (next page). Three initiatives for each Energy and Water business formed the key decarbonisation plan for Ranhill supported by five Group-wide initiatives forming the backbone in transforming Ranhill into a Net Zero organisation.

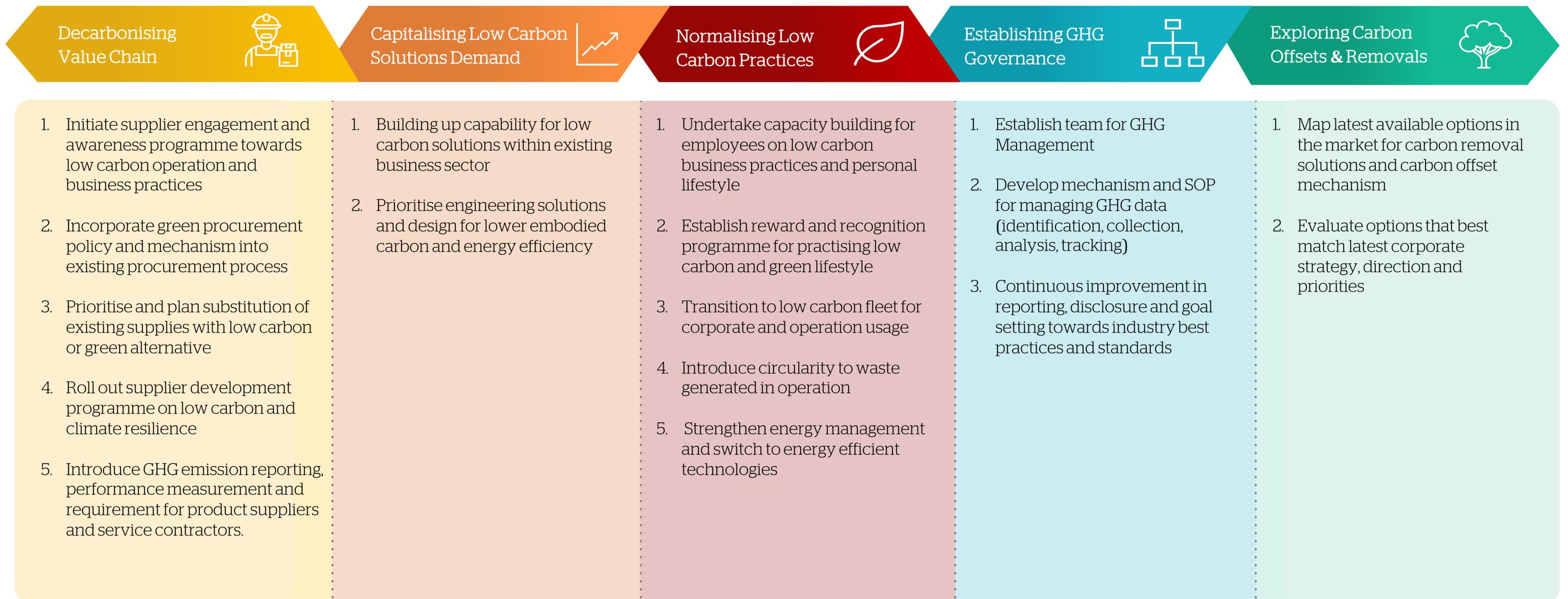
STRATEGIES		FOCUS AREAS
 Pioneering Low Carbon Technologies	1. Decarbonised energy portfolio	Lowering the emissions per electricity generated by our energy business through either the construction or acquisition of new renewable energy power plants
	2. Leading industrial adoption	Becoming the industrial leaders of adopting innovative low-carbon technologies in every business sector
	3. Low-carbon solutions	Offering engineering services incorporating the latest decarbonisation technologies
 Accelerating Green Operational Excellence	4. Emissions management	Developing internal capability to understand and evaluate our GHG emissions performance
	5. Responsible energy use	Managing energy consumption through energy efficiency and operations optimisation
	6. Renewable energy integration	Reducing the impacts of our electricity consumption by using renewable energy
	7. Sustainable sourcing	Minimising the environmental impact of our purchasing decisions
 Fostering Climate Attuned Talent	8. Circular operations	Adopting circularity in our operations
	9. Low-carbon expertise	Building up our capability to execute and deliver projects that can contribute to decarbonisation
	10. Green professionals	Attaining the appropriate certifications and qualifications to validate our capabilities
	11. Low-carbon mindset employees	Instilling the mindset and habit for employees to practice low carbon lifestyle

Our Net Zero Implementation Framework



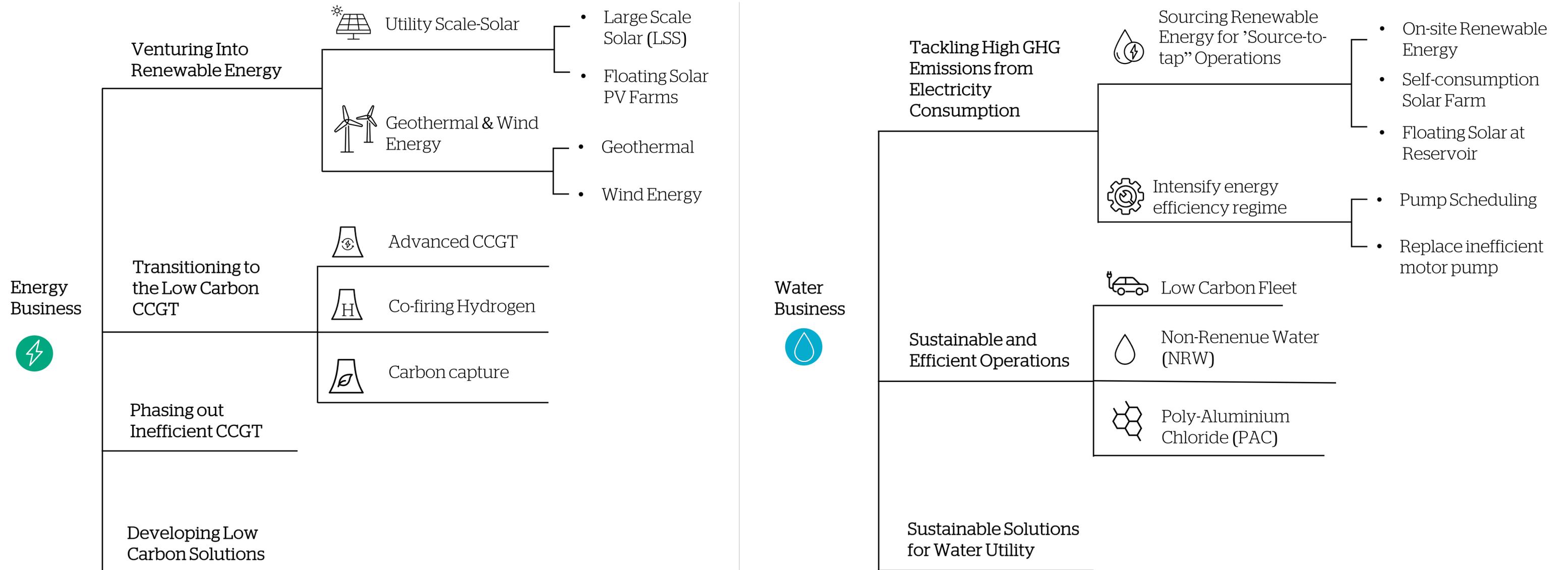
Group-wide Initiatives

Ranhill will implement group-wide initiatives as part of our overall decarbonisation strategy as we strive to create a mindset which includes sustainability as a lens to view all business activities and decisions. While the decarbonisation pathways of our energy and water businesses are focused on tackling our Scope 1 and 2 emissions, a majority of our Group-wide initiatives will address Ranhill’s Scope 3 emissions irrespective of the business nature and operations of our subsidiaries. Emissions under Scope 3 involve multiple parties – employees, suppliers, contractors and customers. Five key initiatives are:



04 Ranhill Decarbonisation Pathways

This section outlines the mitigation options in decarbonizing the Energy and Water business of Ranhill. The diagram below summarises the strategies and options for the respective business applicable to meet both our short-term interim targets and our Net Zero aspiration.

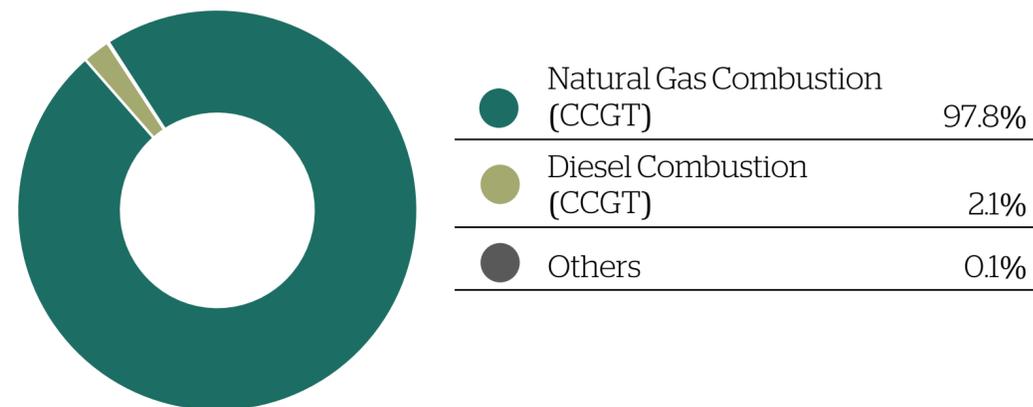


Decarbonisation of Energy Business

The emissions profile of Ranhill’s energy business is illustrated below. For the baseline year of 2022, the main emission source was the fuel combustion for the gas-fired power plants where natural gas combustion made up 97.8 percent of emissions while diesel combustion at 2.1 percent. Following IPCC recommendations, the fuel combustion of our CCGT power plants shall be the focus areas for the decarbonisation of the energy business.

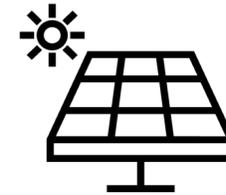
Energy Business Scope 1 and 2 Emissions

Top largest emission sources was due to natural gas combustion or energy generation



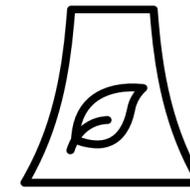
- Total Emissions (S1 & S2): 1,306,167 tCO₂e
- Top 2 largest emissions sources (99.9%) are selected for mitigation.
 1. Natural Gas Combustion (CCGT)
 2. Diesel Combustion (CCGT)
- IPCC recommends cumulative sources up to 95% for prioritisation.
- Mitigation measures for remaining sources will not be addressed and will be tackled via carbon offset.

Ranhill Energy Business Direction and Landscape



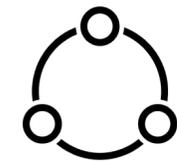
Venturing into Renewable Energy

- Ranhill is expanding our energy business portfolio by pursuing potential opportunities in solar, geothermal, and wind.



Transitioning to Low Carbon and Zero Carbon CCGT Power Plants

- Recognising that natural gas will remain essential to Malaysia’s primary energy supply mix, Ranhill is adopting advanced and highly efficient CCGT technologies and innovative approaches as they become available for our future gas-fired projects.



Developing Low Carbon Solutions and Services

- In the journey of decarbonising the energy business, Ranhill will leverage upon resources within the group to deliver the critical services for large-scale solar, geothermal, wind, and carbon capture and storage projects.

The power utility industry has adopted emissions intensity reduction as the global standard in measuring its decarbonisation and we have followed suit. Ranhill’s energy business has a declared interim target of a 25 percent reduction in emissions per electricity generated by 2030. With renewables and particularly LSS making significant inroads into our portfolio of energy assets in the coming years, they will begin to have a sizeable impact on this metric.

This is aligned with our approach for the energy business which is to achieve 90 percent reduction in emissions per electricity generated by 2050 as compared to the base year. This in turn is aligned with the established global best practices in use by the energy industry.

Venturing into Renewable Energy

In aligning with the nation's ambitious target of 70 percent RE installed capacity in the power generation mix by 2050, Ranhill is expanding its energy business portfolio by pursuing potential opportunities such as solar, geothermal, and wind. This will significantly contribute towards attaining the target of 25 percent emissions per electricity generated from 2022 levels.

Utility-scale Solar

Solar photovoltaics (PV) will be one of Ranhill's main focus in RE as it is poised to revolutionise the global energy landscape as well as taking into account the nation's substantial technical potential for power generation from solar PVs, which is in the region of 269 GW.



1. Growing the LSS segment

- Ranhill's foray into the solar energy business began when it was awarded the LSS4 project in Bidor. Boasting a capacity of 50 MW, this maiden plant is scheduled to become operational by 2023. The EPCC contractor for the project is a Ranhill subsidiary - Ranhill Bersekutu Sdn Bhd (RBSB) who is also set to handle the operation and maintenance (O&M) of the solar farm upon its commissioning.
- Moving forward, Ranhill will grow the number of LSS in our portfolio by bidding for more such projects to increase the RE share of the energy business. As such, Ranhill would be prioritising in several areas:
 - Accelerating technical research on potential sites
 - Capability development within the group to build LSS farms. This will reduce costs, making bids more attractive.
 - Capability development within the group to operate and maintain LSS farms. This will have synergistic benefits as feedback from within the group will ensure that the farm will be constructed for optimal operating conditions.
 - Continued engagements with stakeholders on potential LSS projects



2. Exploring Floating Solar PV Farms

- Ranhill is exploring the possibility of including floating solar farms as part of our energy business portfolio. In exploring this opportunity, Ranhill is able to leverage on its water business which currently has 10 dams under operation. Besides utilising the renewable energy for the self consumption of our water business, such floating solar farms will tremendously expand the ability of Ranhill to implement LSS projects on a competitive basis.
- The development of Hybrid Hydro-Floating Solar PVs at a local hydro dam reservoir is validating the feasibility of this source of renewable energy, and Ranhill has the ability and potential to rapidly replicate them. As part of our post-2030 plans, Ranhill will investigate floating solar panel technologies that are able to track the sun as it passes through the sky, thereby maximising solar power production.



Geothermal and Wind Energy

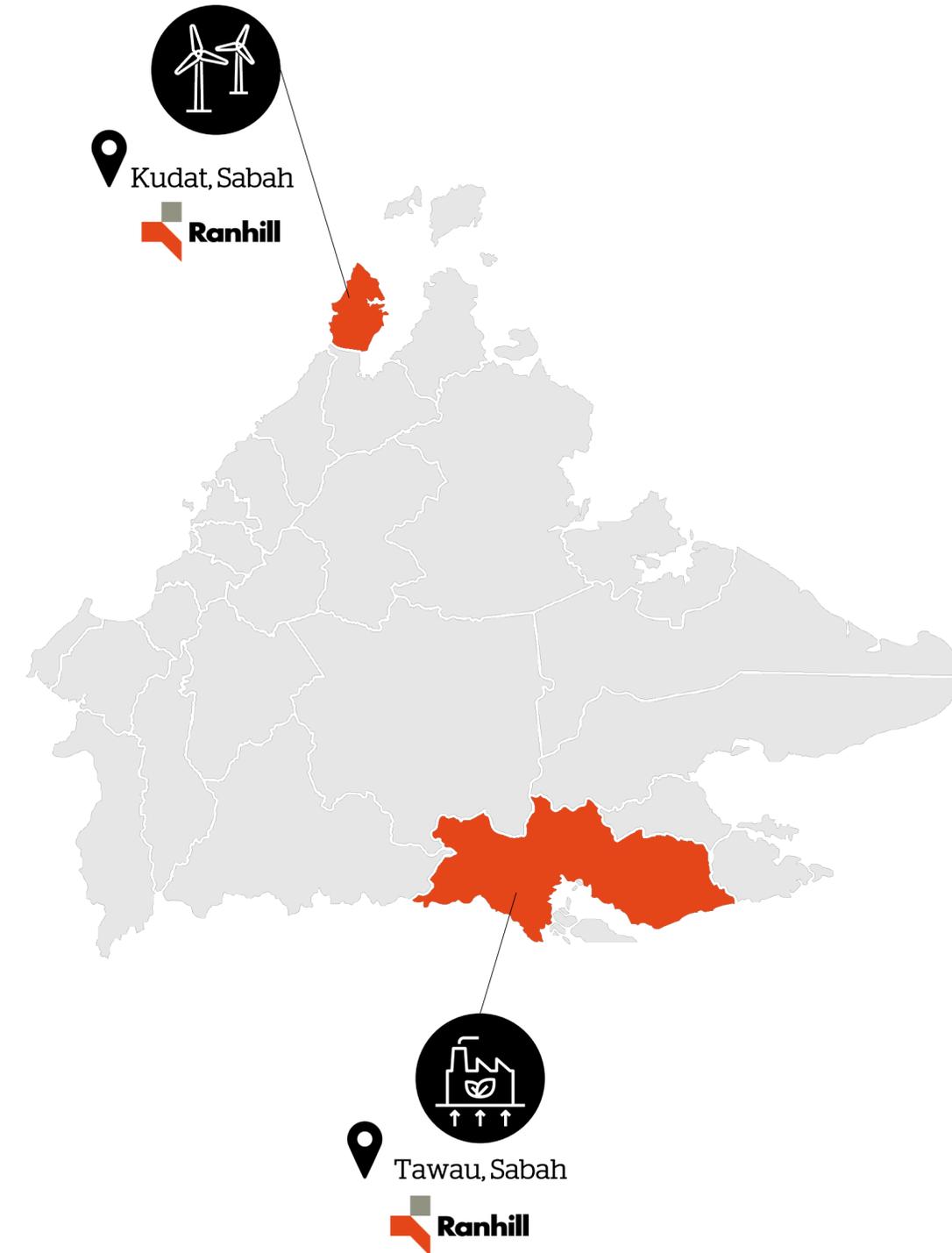
While the technical potential of solar PVs dominates at nearly 93 percent of the national RE technical potential, Ranhill will also explore other sources of renewable energy options in expanding its RE asset portfolio.

3. Pushing Geothermal Energy Forward

- Geothermal energy is an important source of renewable energy that has been recognised by the NETR under the Sabah Energy Security Initiative, under which the feasibility of geothermal energy for power generation will be assessed. In terms of maturing the technology, Malaysia lies in between Singapore which is still in the study phase, and Thailand where geothermal power is already part of the generation mix.
- In pursuing this opportunity, Ranhill has put in a bid for developing a geothermal resource in Tawau, Sabah. Its potential has been identified after the successful completion of slim-hole drilling, and tests have confirmed the pressure and temperature profiles. Technical studies suggest that It has the capability of exporting up to 30 MW to the grid under the Feed-in-Tariff (FiT).

2. Revisiting Wind Energy

- Previous technical studies have suggested that Kudat, Sabah is a location where sufficiently high wind speeds are prevalent which can be harnessed for power generation. As the cost of wind turbines have substantially declined while their power generation capacity has continued to improve over the years, Ranhill will revisit the possibility of making the harnessing of wind energy in Sabah part of our RE asset portfolio.





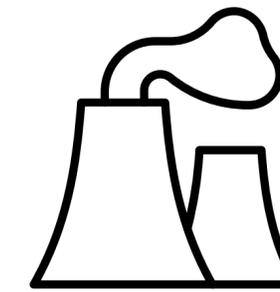
Transitioning to Low Carbon and Zero Carbon CCGT Power Plants

As an existing operator of CCGT plants, Ranhill is well-positioned to benefit from the projected increase of natural gas to ensure a just energy transition. At the same time, Ranhill acknowledges the impact of our activities on the environment and we recognise that sustainable development is a vital component of our responsibilities towards society and future generations. In our drive to reduce the emissions per electricity generated by our energy business, we will adopt advanced low carbon or zero carbon CCGT technologies as they become available for our future gas-fired projects. In addition, we will also continue to improve on the efficiencies of our existing CCGT plants through productivity improvements, enhancing operational excellence and introducing of innovative technologies as part of the decarbonisation strategy of the energy business.

To ensure continued security of supply and delivering the flexible power necessary in a power grid that will be increasingly dominated by intermittent renewables, Ranhill is pursuing the development of a flexible yet low carbon generation portfolio of generation assets. In this regard, Ranhill will explore building new CCGT plants that incorporate CCS technologies to remove GHG emissions.

Phasing Out Inefficient CCGT

To ensure our Net Zero 2050 aspiration becomes a reality, we will undertake the high-grading of our CCGT portfolio. RSE I will be decommissioned once it reaches the end of its economic and engineering design life. Meanwhile, we will not seek the renewal of the PPA for RSE II upon its expiry and remove the plant from our portfolio of energy assets.



Ranhill CCGT Power Plants (Malaysia)

CCGT 1 (RSE I)

- o Location: Kota Kinabalu
- o Installed capacity: 190MW
- o COD: 2008
- o PPA expiry: 2029

CCGT 3 (New)

- o Location: Kimanis
- o Installed capacity: 100MW
- o Expected COD: 2026
- o PPA expiry: 2047

CCGT 2 (RSE II)

- o Location: Kota Kinabalu
- o Installed capacity: 190MW
- o COD: 2011
- o PPA expiry: 2032

CCGT 4 (New)

- o Location: Sandakan
- o Installed capacity: 300MW
- o Expected COD: 2027
- o PPA expiry: 2048

CCGT 5 (New)

- o Location: Kedah
- o Installed capacity: 1,150MW
- o Expected COD: 2028
- o PPA expiry: 2049

● Existing

● New



Peterhead low-carbon CCGT power station (910MW) with a carbon capture plant (CCP) at Scotland

Enhancing Plant Efficiency and Operational Excellence

Currently Ranhill operates and maintains two CCGT power plants which contribute to about 40 percent of the total generating capacity in Sabah, RSE I (190 MW) & RSE II (190MW). As part of our efforts to reduce the emissions, we will continue to improve upon the operation of our existing CCGT plants through efficiency and optimisation measures. We will prioritise operating both plants in the full Combined Cycle Operating Mode to minimise GHG and other emissions. Through effective maintenance programmes, optimal operational performance of the turbines can be ensured with the reduction of generated heat rate.

1. Co-firing With Hydrogen

- By 2028, Ranhill targets to almost double our CCGT installed capacity to 1,550 MW from the current 380 MW. At the same time, we acknowledge that we have a responsibility to safeguard the environment. Leveraging on the flexibility of gas turbines that can operate on alternative zero carbon fuels such as green hydrogen, Ranhill is exploring the possibility of introducing hydrogen blending in our existing CCGT power plants. This can lead to little to no GHG emissions resulting from combustion activities.
- The same will be done for our planned new CCGT plants, we will adopt highly efficient CCGT technologies that are also hydrogen-ready. Recent developments suggest that generation capacities of up to 600 MW and hydrogen blends as high as 50 percent are already possible with current technologies.

2. Carbon Capture in CCGTs

- To ensure energy security is not compromised with decarbonisation of the grid, Ranhill will leverage upon resources within the group to ensure the planned new CCGT plants incorporate CCS technologies to remove GHG emissions.
- Combination of the following factors: (1) Scaling up new technologies, (2) adopting low carbon and renewable solutions, and (3) leveraging large-scale engineering and project management capabilities, are key levers to CCS competencies of Ranhill. For example, our Ranhill Worley subsidiary has a proven track record in CCS as it is providing engineering design services for the Kasawari gas field development.

Developing Low Carbon Solutions and Services

In pursuing the development of low carbon solutions and services, Ranhill will be able to leverage upon resources within the group. Our subsidiaries have the capability to provide a comprehensive range of multi-disciplinary low carbon consultancy, engineering and project management services, providing technology leadership in such areas as large-scale solar, geothermal, wind and carbon capture and storage. Apart from the direct provision of low carbon services, such expertise can be harnessed internally in the development of leading-edge solutions that will cement Ranhill’s pre-eminence as an industry leader in the adoption of low carbon innovation.

Decarbonisation of Water Business

The emissions profile for Ranhill’s water business for the base year is shown below. Purchased electricity for its “Source-to-Tap” operation is by far the largest source, responsible for a staggering 98.1 percent of overall emissions. This is followed by purchased electricity for the administration buildings at 1.0 percent, and the others including operation of our company fleet, gas leakage, and operation generator as backup at 0.9 percent. As the emissions stemming from purchased electricity for our Source-to-Tap operations makes the other remaining sources pale in comparison, it has been selected to be our water business’ focus area for decarbonisation.

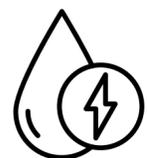
Water Business Scope 1 and 2 Emissions

The most significant emission source is the electricity consumed for “Source-to-Tap” operations.



- Total Emissions (S1 & S2): 293,066.20 tCO₂e
- Source-to-Tap operations as the largest emission source (98.1%) is selected for mitigation.
- IPCC recommends cumulative sources up to 95% for prioritisation.
- Mitigation measures for remaining sources will be addressed and residual will be tackled via carbon offset

Ranhill Water Business Direction and Landscape



Tackling High GHG Emissions from Electricity Consumption

- The high electricity consumption of the water business is the immediate priority in realising the sector’s short-term targets.
- Ranhill is tackling the high GHG emissions from purchased electricity by displacing it with power generated from renewable sources and increasing the efficiency of our operating machinery. This is aligned with the NETR levers of energy efficiency and renewable energy.



Sustainable and Efficient Operations

- To decarbonise our transportation, we will introduce Electric Vehicles (EVs) or Energy Efficient Vehicles (EEVs) into our fleet that are fit-for-purpose to our operational requirements.
- We will also improve water supply and distribution water management services and reduce non-revenue water to reduce overall Source-to-Tap energy consumption.



Sustainable Solutions for Water Utility

- Ranhill is committed to accelerate the adoption of eco-friendly practices and process improvements that yield reductions in direct and indirect GHG emissions.
- These will include some readily-available options, using established processes and known technologies, as well as more innovative options involving emerging technologies.

In line with established global best practices of the water utilities industry, the decarbonisation of Ranhill’s water business will be in the form of absolute emissions reduction, in which 90 percent of absolute GHG emissions as compared to the baseline of year 2022 will be reduced by 2050 with the remaining residual emissions to be neutralised via carbon removal and offsetting options.

Tackling High GHG Emissions from Electricity Consumption

Water utilities is an energy-intensive industry as power-intensive pump motors are used for pumping raw water for treatment and to distribute treated water to consumers. Hence, an immediate priority is for Ranhill to utilise electricity generated from renewable sources to power its water treatment and distribution operations.

Sourcing Renewable Energy for Source-to-Tap Operation

1. On-site Renewable Energy

Ranhill’s water business has had prior success in displacing high GHG emissions electricity with that generated from renewable sources. A 64 kWp Solar PV System has been installed on-site and is currently operational at the 20 MLD Sultan Iskandar WTP, supplying the plant with renewable power for self consumption. Moving forward, we will grow the number of onsite Solar PV installations at our WTPs and Pumphouses in the foreseeable future, prioritising those sites with the highest power consumption.

Besides solar, we are also tapping into the potential of additional on-site small hydro installations. This type of hydro power plant avoids excessive water storage thus will not disrupt the operations of the WTPs and pump houses. It is also among the most cost-effective sources for off-grid power generation and has minimal space requirements. Currently, a 74 kWp Micro Hydro Plant has been installed and is operational at the Gunung Ledang Water Treatment Plant in Tangkak, Johor. Moving forward, we will install an additional 40kWp micro hydro plant at the Gunung Pulai WTP, a site that had previously been identified.



64 kWp Solar PV installed on Sultan Iskandar WTP has reduce dependency for electricity from Grid



Gunung Ledang Water Treatment run on full renewable energy from electricity generation of 74 kWp Micro-Hydro

 **2. Self-Consumption Solar Farm**

We will source renewable power under the Corporate Green Power Programme (CGPP) for self-consumption of water business operations. As of today, Ranhill has submitted a Request for Proposal (RFP) to the Energy Commission (ST) to construct one 29.9 MWac solar farm to supply clean energy to Ranhill SAJ. In addition to that, we are in discussions with Suruhanjaya Perkhidmatan Air Negara (SPAN) and ST to develop a slew of onsite solar PV power generation plants ranging in capacity from 75MWac to 200MWac for the sole and exclusive electricity consumption of Ranhill SAJ under the self consumption guidelines. Already approvals have been granted for one such plant with a 70 MWac capacity.

 **3. Floating Solar at Reservoir**

With 10 dams under its operation, Ranhill SAJ is in strategic position to study the feasibility of implementing floating solar farms. Besides utilising the renewable energy for its own self consumption, such solar farms will tremendously expand the ability of Ranhill to implement LSS projects on a competitive basis in future.

Intensify Energy Efficiency Regime

In our quest to further enhance the efficiency of our equipment, Ranhill has implemented motor efficiency monitoring. This is in addition to conducting preventive maintenance on existing motors during their lifespan to improve their efficiencies. Motors found to have low efficiencies of below 65 percent will be replaced with higher efficiency options available in the market to further realise energy savings of up to 2.5 percent. Optimal pump scheduling has been shown to substantially reduce the energy requirements of a water distribution system. Thus, Ranhill should be able to attain significant reductions in GHG emissions by implementing optimal pump scheduling in our water distribution operations.

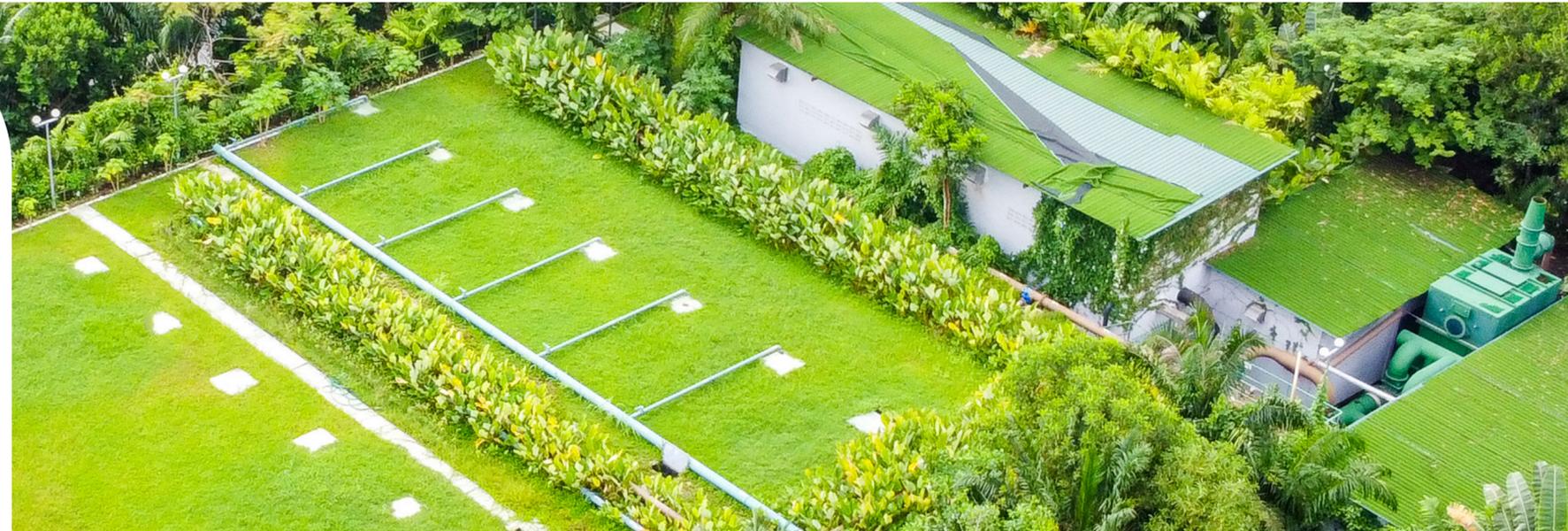


1MWp Floating Solar-Tengeh Reservoir Public Utility Board (Singapore) in their effort to replace carbon-based Energy Sources With Alternative Sources

Sustainable and Efficient Operations

Increasing the number of Electric Vehicles (EVs) or Energy Efficient Vehicles (EEVs) that are fit-for-purpose in our fleet is one step we will take to decarbonise our vehicle usage. We have already begun replacing vehicles that have reached the end of their economic life with EEV such as Perodua Bezza passenger cars and Isuzu D-Max 4x4s. We are also running trial programme on electric motorcycles to assess its suitability with SAJ mobility requirement.

We will keep improving the management and maintenance services of our Source-to-Tap operations by addressing Non-Revenue Water (NRW) to ensure efficient utilisation of raw water resources. Furthermore, as a highlight of our adoption of best techniques for efficient operation, we are using Poly-Aluminium Chloride (PAC) instead of traditional Aluminium Sulphate (Alum). Besides being more efficient for coagulation, PAC leaves little residual aluminium and produces less sludge, indirectly leading to lower GHG emissions.



Sustainable Solutions for Water Utility

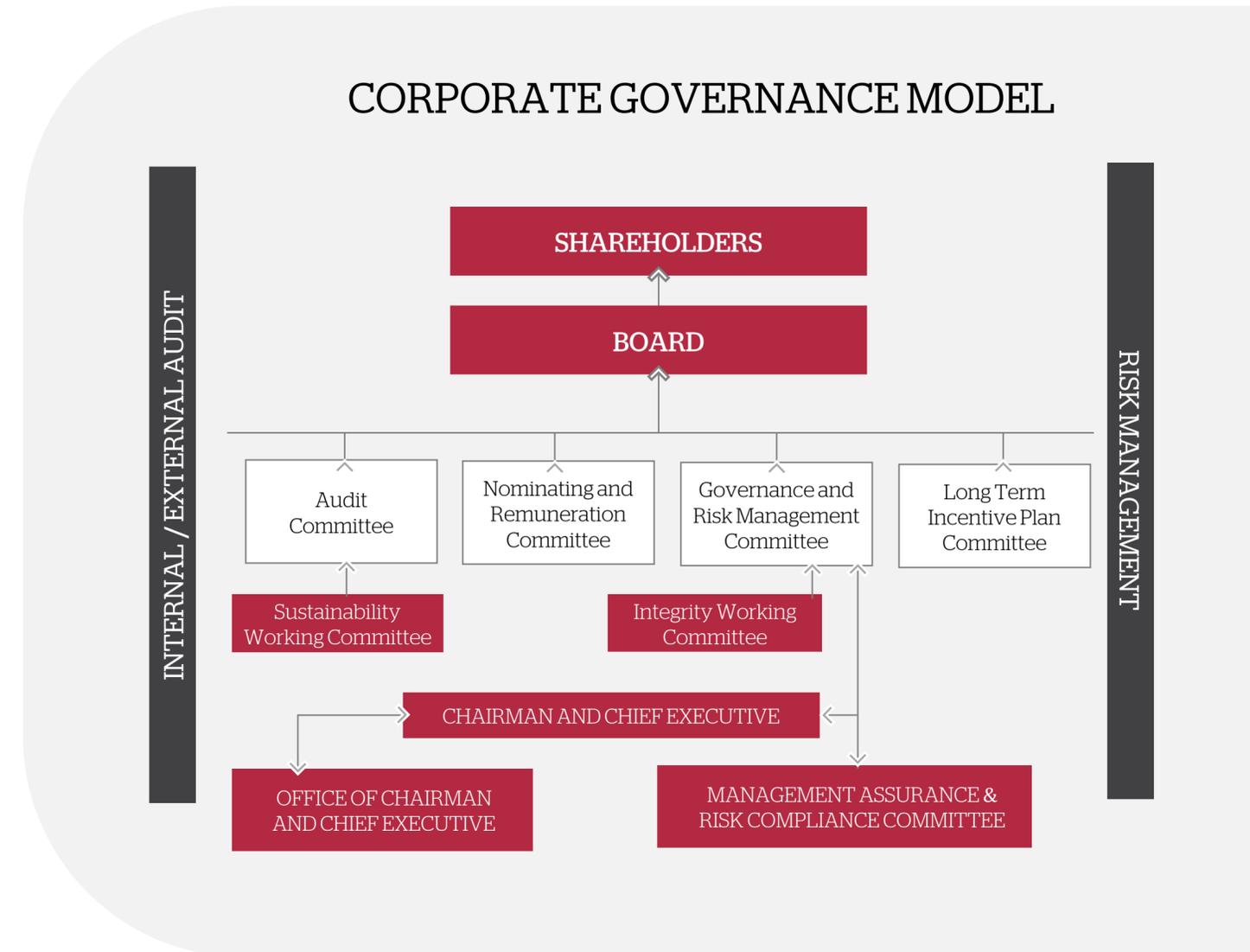
Ranhill will enhance our internal capability to offer better and more sustainable water treatment and distribution options. While RWS is a prime showcase of partnerships between our subsidiaries though providing NRW solutions for Ranhill SAJ, RWS has also proven their capabilities by providing NRW solutions to other regional utility companies.

Additionally, RWT has the expertise on delivering engineering solutions for advanced and sustainable water and wastewater management with the successful delivery of multiple sewage treatment plants (STPs) for various clients. As part of our efforts to realise a circular economy, we will also explore the repurposing of sludge residue to be incorporated into construction materials such as bricks, as well as reusing it for agriculture purposes.

05 Governance

As part of upholding and sustaining our commitment towards various goals and action plans, the following formed key elements for successful implementation.

- 1 COMMITTEE.**
 The Sustainability Working Committee at Ranhill is established with the primary purpose of driving and overseeing the company's sustainability initiatives. The Committee, which reports to the Audit Committee, consists of Group HoDs and the CEOs of subsidiaries.
- 2 GHG MANAGEMENT TEAM**
 A team will be set up to form the internal GHG Management Team to support our group-wide sustainability agenda to deliver on our Net Zero 2050 aspiration. Consisting of dedicated subject matter experts, it also provides strategic oversight of our sustainability metrics and ensures the rigour of our GHG measurement practices. Currently, such a setup is available only at Ranhill SAJ and is known as the Energy Management Committee, responsible for monitoring the GHG emission of the business.
- 3 ANNUAL ASSESSMENT**
 Continuing with the current practice, annual GHG assessments will be conducted for all nine subsidiaries on their respective Scope 1, Scope 2 and Scope 3 emissions. Continuous improvements will be performed on data quality, particularly in terms of coverage, supplier-specific emissions, supplier activity data and internal data verification. For Scope 3, assessments of supplier readiness on emissions and work towards collaborating on emissions reduction will be initiated.
- 4 PERFORMANCE TRACKING**
 We will be cascading the various mitigation targets and emission targets as part of our corporate and group KPI. To ensure that Ranhill achieves its various targets, progress against them will be tracked internally. We are establishing a centralised data collection system for GHG inventory and performance tracking.
- 5 DISCLOSURE AND REPORTING**
 Currently, for the purposes of disclosure and reporting, we are adopting GRI and FTSE indicators as guidelines. To strengthen our climate commitment efforts, we shall examine Science-Based Targets initiative (SBTi) with a focus on understanding its goals and methodology with a view to further refine our disclosure and reporting in future.



Glossary

Carbon dioxide equivalent (CO₂eq)	A metric used to quantify the climate impact of different GHGs.	Indirect emissions	Emissions resulting from an actor's activities, such as the production or consumption of goods, but that occur at sources that the actor does not own or control. For instance, emissions from fossil fuel generation are considered indirect emissions of an electricity consumer.
Carbon Removal	Activities that remove CO ₂ from the atmosphere and store it in some durable way. The tons of CO ₂ that are removed are often referred to as removals or negative emissions. Removal activities may be nature-based, such as reforestation or adding carbon to soils, or technological, such as direct air carbon capture combined with geological storage.	Mitigation	Actions to limit climate change and its effects by reducing GHG emissions or enhancing removals.
Carbon Offsetting	The use of carbon credits generated from mitigation activities outside a country, jurisdiction, or company supply chain for which emissions are measured and accounted, toward a compliance obligation or voluntary pledge of a country, jurisdiction, or company.	Neutralization	CO ₂ removals from the atmosphere to counterbalance residual emissions. Such removals may occur inside or outside a country or a company value chain.
Decarbonisation	Decarbonisation is the process of reducing or completely eliminating carbon emissions.	Nationally Determined Contribution (NDC)	A term used under the United Nations Framework Convention on Climate Change (UNFCCC) whereby a country that has joined the Paris Agreement outlines its plans for reducing its emissions
Direct emissions	Emissions that are directly physically released into the atmosphere by an activity or process under an actor's ownership or control.	Net Zero Emissions	A state where balance between the amount of greenhouse gas (GHG) produced and removed from the atmosphere.
Greenhouse Gases	Greenhouse gases (GHGs) are gases in the earth's atmosphere that trap heat. These gases act like the glass walls of a greenhouse - hence the name greenhouse gases.	United Nations Framework Convention on Climate Change (UNFCCC)	The international treaty established to prevent dangerous anthropogenic climate change. The Paris Accord is an agreement adopted under the UNFCCC.



Ranhill

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