CLIMATE RISK & RESILIENCE

Assessing potential impacts and adapting to future conditions

Ramboll Environ
Ramboll Environ’s sustainability and climate change professionals, engineers and risk assessment specialists have extensive expertise offering climate risk assessment, climate adaptation, climate risk due diligence and flood risk management services to help both the public and private sectors, at national, regional and local levels. We help our clients quantify the financial implications of climate change, and find alternative solutions for the consequences.

Our support ranges from high-level scoping and benchmarking studies to full climate risk assessments and/or climate adaptation planning. Our assessment work ranges from single sites through to multi-site, multi-jurisdictional portfolios, as well as entire organisations, cities or regions.
**THE CHANGING ENVIRONMENT**

Recent extreme climate events around the world, particularly flooding, heat waves and bushfires, have demonstrated the vulnerability of property, infrastructure, assets and communities to climate extremes.

It is critical to take steps to minimise these potential impacts, while tailoring each action to address local vulnerabilities. As the climate changes, the need to accurately assess and account for all potential areas of climate risk and liability has emerged. Once risk is assessed, holistic, cross-boundary, cross-discipline adaptation is required.

**WHY CLIMATE RISK & RESILIENCE**

<table>
<thead>
<tr>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hard asset impacts: flood, fire, sea-level rise</td>
</tr>
<tr>
<td>• Resource availability and price volatility: water, agriculture</td>
</tr>
<tr>
<td>• Logistical impacts: severe weather events</td>
</tr>
<tr>
<td>• Operational costs: increased need for space and product cooling, increased vendor costs (due to items above)</td>
</tr>
<tr>
<td>• Revenue impacts: impacts to at-risk consumers</td>
</tr>
<tr>
<td>• Stakeholder concerns: investor, insurer and employee concerns about business stability</td>
</tr>
</tbody>
</table>

“An alliance between homeowners, businesses, scientists and researchers, state/provincial and federal government and the insurance industry is needed to prevent and mitigate the results of such extraordinary climatic events. All entities need to increase their awareness and understanding of the increased risks in exposed regions and how they can adequately prepare for a catastrophe.”

Munich Re, 2014

“Warming has seen Australia experiencing more warm weather and extreme heat, and fewer cool extremes. There has been an increase in extreme fire weather and longer fire season, across large parts of Australia.”

CSIRO, State of the Climate 2014
CONTEXT, ANALYSIS, ASSESSMENT, PLANNING & BUILDING CAPACITY

Ramboll Environ’s expertise in climate risk assessment, coupled with our extensive experience supporting corporate clients in a wide range of sectors, allows us to address climate risk in an efficient and business-centred fashion.

1. **Start-up and context**: undertake scoping works to identify the current context for clients managing climate risk.

2. **Climate analysis**: undertake and review available climate modelling and analyse past climatic conditions along with the performance of assets and communities.

3. **Climate risk assessment**: identify climate risks in a climate-risk register to understand, predict and quantify potential impacts from future climatic conditions, such as more frequent and intense heatwaves, flooding, sea-level rise, bushfires, storms etc.

4. **Climate adaptation and resilience**: identify areas for adaptation, develop plans and pathways, and identify costs and benefits of options.

All of these steps are underpinned by efforts to build capacity and resilience through engagement, training, strategic alignment, and communication.
Ramboll Environ Approach to Climate Adaptation

4. Climate Adaptation and Resilience
   Options: What responses are available?
   Balanced Portfolio: What are the priority actions?
   Execute: How feasible are our implementation options?
   Barriers/Enablers: What obstacles and support exist?

3. Climate Risk Assessment
   Detailed Climate Risk Assessment: What is the extent of the risks, including timing, thresholds, interdependencies, triggers and limits?
   Hotspots: What are the priority areas for detailed assessment?
   Controls: How effective are existing controls?
   Quantity: Can we quantify the consequences on assets/operations?
   Costs: What is the magnitude and cost of the risks and opportunities?
   Interdependencies: What climate interdependencies and flow-on impacts are there, including our supply and distribution chain?

1. Start-Up and Context
   Context: Where and how are we exposed to climate?
   Sensitivity: What assets and services are most exposed and sensitive?
   Opportunities: Where are the new opportunities?
   Barriers: What is blocking our response?
   Involvement: Who do we need to involve?

2. Climate Analysis
   Historical: What is the past climate showing us?
   Performance: What has been the response of assets/services to past climatic events?
   Future: What can happen to the climate in the future?
   Understanding: How do we deal with uncertainty?

Capacity and Resilience Building
Integral and Interwoven into Steps 1-4
   Engagement: What is the commitment and understanding amongst key stakeholders (internal/external)?
   Education: What training is required?
   Embed and Enable: How do we embed management of risks?
   Governance: What are the policy insurance and liability implications?
   Communication: How can we effectively communicate what we need to do?
1. START-UP AND CONTEXT

Ramboll Environ specialists help clients identify the organisational context in which they operate:

- Do we have an appropriate commitment to assessing risks and opportunities from a changing climate?
- Can we get insurance for our assets into the future?
- What future climate liabilities and risks are potentially being transferred to us?
- What are the potential implications in supply and distribution chains from a changing climate?
- What are others in our sector doing to address climate risk?
2. CLIMATE ANALYSIS

Ramboll Environ specialists undertake and review available climate modelling and analyse past climatic conditions using leading software and methods. Our team can provide climate modelling downscaled to the local level (0.25km²) which enables more in-depth analysis. We couple this modelling output with GIS layers to enable quantification of impacts on buildings, infrastructure, natural assets and communities. We apply Monte Carlo techniques, probabilistic risk assessments, scenario planning, uncertainty analysis and other approaches.

3. CLIMATE RISK ASSESSMENT

Climate risk assessment goes beyond traditional risk and liability issues; a changing climate presents new material issues and new and emerging risks. We help clients identify and assess climate risk and provide advice by answering these questions:

- What is the extent of climate risk, including timing, thresholds, interdependencies, triggers and limits?
- What are the priority areas or hotspots for detailed assessment and treatment?
- How effective are existing controls?
- What is the magnitude and cost of potential impacts?
- What opportunities exist in responding to a changing climate?
- What climate interdependencies and flow-on impacts are there, including impacts on supply and distribution chain?
4. CLIMATE ADAPTATION & RESILIENCE

We help clients identify appropriate, cost-effective and meaningful adaptation options to address risks. We use cost-benefit analysis and other approaches to steer clients through the following adaptation options:

- Risk avoidance (e.g. relocation, redesigning supply and distribution chains)
- Adapting standards and traditional approaches
- Building structures/defences (Harden options)
- Retreat or transform

Opportunities

With our guidance, many sectors and organisations are able to identify commercial and other opportunities in response to a changing climate.

Adaptation Pathways

We have extensive expertise in adaptation pathways, including the application of facilitated processes to map out timelines for action across the following continuum:

- Short term (<15 years): Current best practice and leading practice
- Medium term (<30 years): Structural and hardened responses, along with emerging treatments, processes and technologies
- Long term (>50 years): Transformational change

This staged approach improves the likelihood of success and develops effective long-term plans to demonstrate real risk reduction and improvements.
**OTHER SERVICES**

**Flood Risk Management**

It is generally accepted that global warming will lead to a rise in global sea level, increasing the risk of flooding in low-lying, coastal regions. An increase in the frequency and severity of extreme weather patterns will further increase this risk, contributing to flooding from rivers and from urban drainage systems of insufficient capacity.

These challenges call for adaptive measures in river basin management, water supply, storm and wastewater management, agriculture and more. Our experience in modelling and risk assessment of flooding from the sea, rivers and drainage systems allows our clients to make informed decisions about future investments. Environmentally and financially sustainable solutions rely on an evaluation of flood risk and costs for climate adaptation.

**Climate-Adapted Buildings and Infrastructure**

Investment in climate-adapted buildings and infrastructure can help safeguard standards of living and avoid undesirable human and material costs from extreme weather and flooding. We assist clients in consideration of climate risk through all stages of a project: acquisition and feasibility, design and planning, construction, operation and management. Regulations and design standards will inevitably need revision to reflect the uncertain climate conditions in the coming decades. In addition probabilistic design approaches, rather than absolute requirements for performance, will be needed.
INTEGRATED SERVICE & INTERDEPENDENCIES

Our highly experienced scientists and engineers provide innovative, robust solutions to the challenges posed by climate change and can successfully steer projects through regulatory and other requirements. We help our clients quantify their risk and exposure while offering cost-effective solutions to climate change challenges.

Climate change adaption calls for a holistic, cross-boundary, cross-discipline approach, involving many sectors, such as transport, energy, infrastructure, urban development and natural resource use, together with protection of natural systems and the wider environment. Our specialists have developed a unique approach to mapping climate interdependencies - the flow-on effects in extreme climate events to other sectors and operations. For example energy supply distribution in a heatwave can have knock-on effects to the operation of public transport services and then to the ability of workers and city residents to go about their day-to-day business.

Vulnerability Assessment

Our team has conducted integrated vulnerability assessments for regional groupings of municipalities and organisations – modelling, mapping and assessing climate exposure and sensitivity (social, economic and environmental) of assets and communities.
DUE DILIGENCE

Climate change risk- and adaption-related due diligence has become an increasingly important area when assessing viability of property, infrastructure and construction projects. Our clients include public and privately held companies; major lending, private equity and investment institutions; international law firms; and commercial developers. For instance Ramboll Environ has been involved in many port-related climate change adaption projects around the world.

BENCHMARKING, LEGISLATIVE & REGULATORY ANALYSIS

Ramboll Environ’s global presence enables us to track current and emerging issues as well as regulatory policies worldwide that affect climate risk and resilience.

Our critical reviews consider the scientific merits and impacts of legislation on a facility or an industry. We are able to provide short- and long-term projections on potential cost implications to business and organisations.

We carry out benchmarking studies to highlight what other organisations are doing to tackle climate risk, enabling organisations to see where they fit in relation to their competitors and peers.
OUR EXPERIENCE

Climate change program: Working with the UK Highways Agency, Ramboll Environ specialists performed research and developed a climate change program to address consequences of climate change; advised on minimising the Agency’s contribution to climate change and on an adaptation strategy; and included a program of cutting-edge research projects.

Climate due diligence: We conducted environmental due diligence of port facilities for investors, including review of climate change risk assessments and impact studies on sea-level rise.

Supply chain climate risk assessment: Our experts staff conducted assessments of climate change risks within the supply chain for a confidential client.

Confidential property developer: We completed a due diligence that included climate risk assessment.

Climate adaptation planning: Our experts conducted a project for RISA in Hamburg that aimed to develop climate adaptation responses for urban water to avoid flooding of basements, streets and properties, as well as water pollution from combined sewer overflows and street run-offs. The project's main objective was to maintain drainage capacity whilst providing increased protection against surface flooding under future climatic conditions.

Monte Carlo quantitative climate risk: Our specialists undertook Monte Carlo quantitative risk assessments for a range of acquisition due diligence projects and for mining operations.

Climate modelling, impact assessment and costing of adaptation options: In 2011 large areas of the city of Copenhagen were flooded. Copenhagen is on the front line of climate change, experiencing increasingly heavy rains. Our experts developed the city's strategic flood masterplan taking account of detailed climate modelling, impact assessment and costing of adaptation options.

Flood damage prevention: We worked with the departments of the city of Helsinki to advise on flood damage prevention. Flood specialists from other interest groups, including the Finnish Environment Institute, the Finnish Marine Research, and the Finnish Meteorological Institute, gathered their knowledge of different types of flooding events and the needs of the city. The need for a comprehensive flood strategy was demonstrated by the exceptional sea flood in the Gulf of Finland in 2005. The sea flood prompted public discussions about the effects of climate change in Helsinki. As a result, the city began several studies and planning schemes in order to prevent damage from predicted future sea flooding events.
ABOUT RAMBOLL ENVIRON

Ramboll Environ is trusted by clients to manage their most challenging environmental, health and social issues. We have earned a reputation for technical and scientific excellence, innovation and client service.

Our independent science-first approach ensures that our strategic advice is objective and defensible. We apply integrated multidisciplinary services and tailor each solution to our client’s specific needs and challenges.

Ramboll Environ is a market leader in the provision of climate risk and resilience services, providing practical and cost-effective advice to a broad range of clients. With 2,100 employees across 128 offices in 26 countries, we provide our clients with strategic and technical support in the following areas:

- Environmental, health and safety due diligence
- Air quality management
- Climate risk and resilience
- Liveable cities and sustainable communities
- Energy efficiency auditing, management and mitigation
- Greenhouse gas and carbon mitigation
- Corporate social responsibility and sustainability
- Environmental impact assessment, planning and approvals
- Environmental management systems
- Ecological and human health risk assessment and contaminated sediments advice
- Contaminated land site audits and advice in relation to the investigation of contaminated land liabilities
CONTACT US

For further information about our climate risk services please contact:

Stella Whittaker
Principal
swhittaker@environcorp.com

Level 3, 100 Pacific Highway
PO Box 560
North Sydney, NSW 2060
+61 2 9954 8100
CONTACT US

For further information about our climate risk services please contact:

Stella Whittaker
Principal
swhittaker@environcorp.com