TWM Financial Risks of Climate Change

Taiwan Mobile have multiplied “Estimated financial implication of the risk before taking action” by 10 to reflect the 10-year time frame and keep updating each year.

1. The implications for changes in regulation

1) Estimated financial implications before action: The "Climate Change Response Act" was passed by the Taiwan government in 2023. This act aims for net-zero GHG emissions by 2050. TWM’s TCFD report, evaluating the financial impacts of TWM’s BAU under the government’s net-zero scenario, carbon taxes will decrease by 2050 due to reduced emissions, but the financial impact of carbon penalties will rise after 2045 due to the widening gap in allowances. Under TWM's BAU strategy, the financial impact in the government’s net-zero scenario will be approximately USD 160 million by 2050, which is about TWD 4.9 billion (30.705 TWD for 1 USD).
2) The TWM cloud data center is equipped with emergency power supply to cope with the power supply problems caused by natural disasters caused by environmental changes.

On the energy-saving design prospective, we adopt Hot/Cold Aisle Containment system, and free cooling with specialized HVAC equipment (such as chillers, cooling towers, ventilation fans, etc.), and LED infrared lighting control system. The overall energy efficiency index follows "The Green Grid" Alliance Silver rating data center certification, when IT is loading 100%, PUE (Power Usage Effectiveness) is 1.5.

2. The implications for changing physical climate parameters or other climate-change-related developments

1) Climate change may cause extreme rainfall, warming, and drought to impact telecom services nearly TWD $6.53 million.

   Risk 1 – Extreme rainfall: In RCP8.5 scenario, TWM has among 200 operations, include 197 have potential flooding, 1 has potential landslide and 2 have potential mudslides. Those can be triggered by extreme rainfall.

   Risk 2 – Increase in average temperature: every increase of 1 degree will increase by 6% electricity air conditioning systems; Taiwan is in the subtropical area; the air-conditioning system room/base of the total electricity consumption will be necessary for taking to 3~4 percent.

   Risk 3 – Drought: Changing weather pattern caused by climate change has led Taiwan to see heavy rainstorms at a certain part of the year instead of a steady rainfall pattern throughout the year, thus the chance of drought happening is much greater. Drought will cause water outages and fire.

2) Mitigation actions are expected to cost over TWD $134 million.

Risk 1 – Extreme rainfall:

i. Power outage prevention: to prevent discontinue of telecommunications services, TWM had bulk purchased 21,632 batteries and prepared 41 generators; base on the service level decide the battery place, important telecommunication facility are equipped with generators. The TWM cloud data center will perform redundant power supply expansion, replacement and maintenance plans every year to avoid service interruption due to power failure caused by natural disasters.

ii. Base stations that are disaster-resistant:

to provide stable and reliable rural telecommunications network to ensure smooth external communication channels to make disaster prevention and relief work efficiently. TWM has 25 broadband mobile base stations, these mobile base stations were used 6 times for disaster prevention activities.

iii. Risk insurance: all types of telecommunications facility and base station equipment have insurance, when the climate changes caused by wind, fire incident, telecommunications equipment damage can be obtained in accordance with the set of insurance contract claims to reduce the amount of loss.

Risk 2 - Increase in average temperature: To prevent operations interruption by higher temperature, we use 740 units of higher temperature equipment and high weather ability power supply systems (SMR), which can withstand 0~65 degrees Celsius in the environmental temperature.

WRisk 3 – Drought: We have a water storage tank which can provide water for 48 hours, and you can monitor the water status on the Building Management System (BMS) in real-time. If water outage is for more than 24 hours, the mechanism of water supplement will be started immediately and will notify the contract vendors to supply water. We set an early detection and extinguishing systems. When a fire alarm occurs, the fire marshal program will be started, and the firefighting team is responsible for controlling the fire. The leading team is responsible for assisting the evacuation. The security team controls the firing range. The emergency ambulance team is responsible for injuries care. Notification team is responsible for notifying the fire department and related units.

regulation risk	Estimated financial implications of the risk before taking action	Description	Estimated costs of these actions	Description
Data center	125,211,615	The maximum penalty for 1tCO2e is TWD 1,500 based on Taiwan's "GHG reduction and Management Act" (https://ghgrule.epa.gov.tw/eng_article/index/15). Considering Taiwan's NDC targeting a 50% reduction from BAU by 2030, TWM may be required by law to achieve a 32.14% reduction from BAU in 2025. TWM GHG projection shows a BAU of 259,721.25 tons, meaning TWM may be liable to a fine of 259,721.25*0.3214*1.5k = TWD 125.2M.	0	The TWM Cloud Data Center is equipped with emergency power generators to mitigate potential power supply disruptions caused by environmental changes and natural disasters. It also features a range of energy-efficient design elements, including a Hot/Cold Aisle Containment system, specialized HVAC systems that enable free cooling (such as chillers, cooling towers, and ventilation fans), and an LED infrared lighting control system. The data center was constructed in alignment with the Silver-level standards defined by The Green Grid Alliance, demonstrating strong performance in energy efficiency. Under a 100% IT load, the data center achieves an impressive Power Usage Effectiveness (PUE) of 1.5. In 2024, the phased expansion of the TWM Cloud Data Center continued, building upon the construction efforts initiated in 2022.

climate-change related developments	Estimated financial implications of the risk before taking action	Description	Average estimated timeframe (in number of years)	Estimated costs of these actions	Description
Data center	106,172	In 2024, the Building Management System of TWM Cloud IDC documented a single hour of power outage caused by TPC. Thanks to the emergency power supply, customers' equipment remained operational, averting potential service disruptions. Based on a compensation rate of $106,172 NT per hour, the total compensation for avoided outages amounted to $106,172 NT.	10	53,280,554	To proactively safeguard service continuity against power outages caused by natural disasters, the TWM Cloud Data Center actively implements robust annual plans that encompass the expansion, upgrade, and rigorous maintenance of redundant power supply systems, ensuring high operational resilience and reliability.
ITI	0	ITI are main support TWM office IT system, so there are no financial implications.	10	10,056,467	Equipment maintenance costs.

climate-change related developments	Estimated financial implications of the risk before taking action	Description	Average estimated timeframe (in number of years)	Estimated costs of these actions	Description
TG	6,427,459	Climate change may cause typhoon, warming and drought; these disasters will impact telecom services. The risk management and the program are as follows: 1. Storm may cause power outage and will be discontinued the telecommunications services. 2. Average temperature rise caused by global warming: when temperatures rise of 1 degree, the electricity generation will increase 6% and the cost of electricity increased as well. 3. Drought will cause water outage and fire, and will impact telecom services. For more details of what TWM cater for such disasters, please refer to the bottom text box.	10	82,420,190	Taiwan is located in the subtropical area with average three to four typhoons per year and national power company introduced a large amount of renewable energy, affecting the stability of power supply. Due to this high-risk environment, risk management and the process are as follows. 1. Power outage: telecommunications services will be discontinued, and we have plenty of batteries and generators ready; base on the service level decide the battery place, important telecommunication facility are equipped with generators . 2. Against disaster base station: to provide stable and reliable rural telecommunications network to ensure smooth external communication channels to make disaster prevention and relief work efficiently. 3. Risk insurance: all types of telecommunications facility and base station equipment have insurance, when the climate changes caused by wind, fire incident, telecommunications equipment damage can be obtained in accordance with the set of insurance contract claims to reduce the amount of loss.

climate-change related developments	Estimated financial implications of the risk before taking action	Description	Average estimated timeframe (in number of years)	Estimated costs of these actions	Description
Total	6,533,631		10	145,757,211	