

PROJECT PROFILE

THE SAUDI BUILDING CODE

Arabian Peninsula



We developed climate zones and design wind speeds that will impact the kingdom's safety and building design for generations to come



Saudi Arabia's intense focus on building and infrastructure over recent years has spurred major growth across the kingdom.

As its cities rapidly develop and mature, officials recognized the need to ensure it was growing as safely as possible – and in ways that can withstand climate challenges presented by various parts of the expansive region.

The challenge

As part of a major update to the Saudi building code, RWDI was retained to provide contoured values for design wind speeds and climate zones for the region that were consistent with the International Building

Code and International Energy Conservation Code. That meant setting one standard that would govern everything from window performance values, cooling system efficiencies, and more.

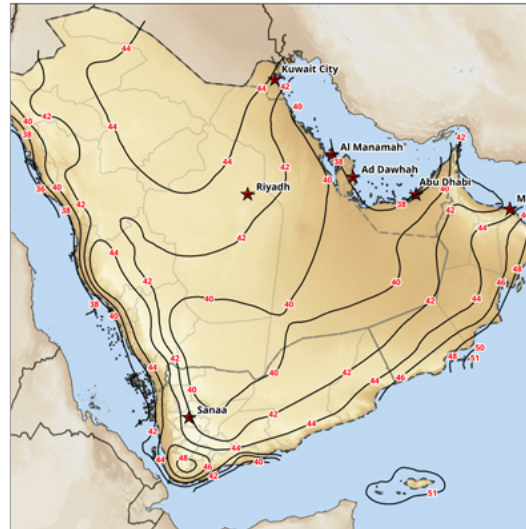
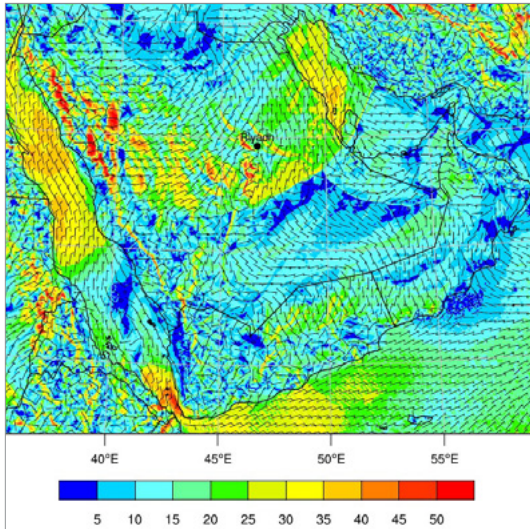
The goal of applying one set of standards across a region with a wide and challenging range of microclimates was a complex one, made all the more pressing by its significance: Decisions it would make would have an impact on the entirety of its built environment, affecting the design of apartment buildings, bridges, roads, city planning and more for generations to come.

Those challenges were exacerbated by its geography. At over two million square kilometers in size, the region covers the vast majority of the Arabian Peninsula. Its landscape is varied, composed of arid deserts, tall mountains and regions prone to extreme thunderstorms and high winds. And over those millions of kilometers, weather observation stations are few and far between. Where scientific monitoring and historical analysis could be conducted, the data was incomplete at best.

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Left: Simulated mean wind speed (km/h) across study region on March 10, 2009

Right: 100-year return period wind speeds (m/s, 10 m, 3-second gust, open terrain)

The solution

RWDI is a company uniquely positioned in the industry to bring expertise and resources in both engineering and climate analysis to the built environment. We fuse together decades of experience and expertise in climate change, the environment, and engineering. Our staff includes meteorologists, engineers, climatologists, experts in numerical modeling and scientists across several related fields.

For the Saudi project, we applied **meso-scale meteorological modeling** to the entirety of the Arabian Peninsula. Using the same models that predict weather, this method involves a numerical simulation to estimate historical weather in areas between observation stations. It captures “middle-scale” occurrences such as winds around mountains and valleys, or breezes from land and sea.

The study, the first of its kind conducted at this scale for the express purpose of informing building codes, was based on historical long-term meteorological data and

our implementation of the state-of-the-art Weather Research and Forecasting model. Through this process, we were able to simulate historical weather for every hour of the thirty-year period from 1988 through 2017 at the relatively high spatial resolution of every four kilometers across the region.

Using the output from the meso-scale modeling, we carried out a **climate analysis**, using sophisticated models and statistical tools to investigate the historical weather record over many years. With these studies, we helped our client understand trends and typical patterns, as well as predict the frequency of the unique wind events that impact the Arabian Peninsula, such as shamals, thunderstorms and tropical cyclones.

Harnessing our world-leading expertise and resources in Geographic Information Systems, we were able to develop a custom set of maps that harmonized all our information geographically.

The result

In early 2020, informed in large part by the exclusive work carried out by RWDI, officials released the 2018 versions of the Saudi Building Code and Energy Conservation Code. These codes are based on ASCE 7 (2010) and the International Energy Conservation Code (IECC), respectively. Soon, this work will be incorporated into a forthcoming unified building code that will cover all seven countries forming the Gulf Cooperation Council— Saudi Arabia, United Arab Emirates, Kuwait, Bahrain, Oman, Qatar, and Yemen.