Iowa Climate Statement 2018: Designing Buildings and Communities for Iowa's Future Climate

Climate change is already here, and it is affecting people, plants, animals, and large sectors of our economy. U.S. climate scientists project that by mid-century heat wave temperatures in Iowa will increase by 7 °F for the average year and by 13 °F once per decade compared to late 20th century heat waves. The strongest rainfall events of the year (annual maximum daily widespread precipitation) covering areas as large as a third of Iowa are projected to double in intensity (daily total rainfall) by mid-century, with most of this change coming before 2025[1]. We must start now to *adapt* our built environment, including buildings and flood mitigation systems, to this changing climate.

Buildings in Iowa must withstand a hotter, more humid climate, with more frequent and extreme storms and dry spells. Strategies for home and business owners for designing, building, retrofitting, and re-envisioning our communities in the face of a changing climate are now necessary and available.

Buildings obviously protect occupants from rain, yet with increasing precipitation, more than just a sturdy roof is required. Water may also enter a building from the foundation or walls. In particular, heavier rain events and higher water tables affect foundations, and standards going forward must reflect that. Building enclosures can be designed to withstand heavier driving rain by integrating rain screens, larger gutters and downspouts, and steeper roof slopes. Green roofs (roofs fully or partially covered with vegetation) could provide greater runoff retention and insulation.

Climate-aware businesses are adapting their buildings through available tools and services such as the B-READY resilience index[2]. The United States Green Building Council [3] recently issued a report recommending adaptation strategies for buildings based on climate regions. Strategies include greater insulation of buildings and more controlled ventilation. In Iowa, well-placed, better sized, dynamically shaded windows in buildings oriented south maximize solar gain in winter and minimize it in summer when the sun is more directly overhead. Dark surfaces can become 40 °F hotter than white surfaces or reflective, cool roofs. The temperature difference between outside and inside determines cooling loads, and cool roof systems will reduce energy costs significantly.

Effective strategies to reduce air conditioning (AC) loads include planting shade trees and weatherizing buildings now to control enhanced energy costs under the effects of climate change.[4] The largest portion of AC load for buildings in the Midwest is attributed to humidity, as it takes far more energy to condense moisture from the air than to simply cool it.[5]

Iowa communities would benefit from adopting localized plans that invest in smart runoff management to reduce the effects of flooding by infiltrating the rain where it falls and slowing the runoff from infrastructure. Green infrastructure (bioswales, rain gardens, urban forestry and permeable pavements) can also have a positive impact on flood reduction.

Ultimately, reducing carbon emissions remains the best long-term strategy to mitigate additional climate change damage, but adaptation now is necessary in today's changed climate. Changing our built environment to be more sustainable and resilient can help reduce future climate change while protecting us from the changes that have already occurred.

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[1] USGCRP, 2017: Climate Science Special Report: 4th U. S. National Climate Assessment, Volume 1. [Wuebbles, D. J., D.W. Fahey, K.A. Hibbard, D. J.Dokken, B. C. Stewart, and T.K. Maycock (eds.)] U. S. Global Change Research Program., Washington DC, USA, 470 pp.

[2] DNV GL Group (Det Norske Veritas - Germanische Lloyd) B-READY building resilience assessment tool https://www.dnvgl.com/services/b-ready-106852; last accessed 06.17.2018

[3] Larson, L., Rajkovich, N., Leightin, C., McCoy, K., Calhoun, K., Mallen, E., Bush, K., Enriquez, J., Pyke, C., McMahon, S., and Kwok, A. Green Building and Climate Resilience: Understanding Impacts and Preparing for Changing Conditions. University of Michigan; US Green Building Council, 2011

[4] Jagani, Ch., Passe, U. (2017); Simulation-based Sensitivity Analysis of Future Climate Scenario Impact on Residential Weatherization Initiatives in the US Midwest, in: Proceedings of the 2017 Simulation in Architecture and Urban Design (SimAUD 2017) Conference in Toronto, CA, edited by: Michela Turrin, Brady Peters, William O'Brien, Rudi Stouffs, Timur Dogan.

[5] Kalvelage, K., Passe, U., Rabideau, S., & Takle, E. S. (2014). Changing climate: The effects on energy demand and human comfort. Energy and Buildings, 76(0), 373-380. doi: 10.1016/j.enbuild.2014.03.009