An Assessment of the Cumulative Effects Review prepared by Stantec for Beacon's Indus AI/Data Center

Prepared by Dr. Brad Stelfox

Citation

Stelfox, J.B., 2026. An assessment of the Cumulative Effects Review prepared by Stantec for Beacon s Indus AI/Data Center. Prepared for the Indus and Area Residents Group.

Author

Dr. Brad Stelfox is a landscape ecologist with the Alces Group who has worked on a wide range of land use issues in Canada and internationally. He is a systems dynamist with a specialty in cumulative effects of land use.

I acknowledge that I have been engaged to be an independent witness to give opinion evidence on issues within my area of expertise and acknowledge that as such I have a duty to provide evidence to the AUC that is fair, objective and non-partisan.

Table of Contents

Executive Summary

My review of Beacon's Artificial Intelligence/Data Center (AI/DC) Indus project focuses on the cumulative effects review completed by Beacon's consultant (Stantec) for the Indus AI/DC project.

The projected frequency and magnitude of the nascent AI/DC sector in Alberta is immense and as such warrants a thorough strategic-level cumulative effects assessment of this transformational and disruptive land use sector. To date, the Government of Alberta (GoA) has not completed such an assessment at either regional or provincial scale and as such Albertans remain largely unaware of the full extent of the environmental and social consequences associated with AI/DCs. While numerous GoA and industry promotional messages have conveyed the projected economic advantages (jobs, GDP, taxable incomes), there is a striking paucity of disseminated information in Alberta about the adverse environmental, social, and health implications arising from individual or multiple AI/DCs. It is the collective sum of benefits and liabilities of individual and collective projects (land uses) that can be defined as cumulative effects assessment.

In a letter dated June 3, 2025, from Minister Nathan Neudorf to Alberta Utilities Commission CEO Bob Heggie, the Minister stated, in part: *The Government of Alberta expects its agencies, including the AUC, to consider cumulative effects and the outcomes associated with them. In addition, the Government of Alberta is committed to managing the cumulative effects of disturbance, including from electricity projects, and remains focused on achieving strategies of Alberta's Land-use Framework*."

Without a provincial level strategic assessment of AI/DC's, its discourse by default appears to reside within the purview of the Alberta Utilities Commission (AUC) and hence discussed at an individual project scale. The AUC Bulletin 2025-12 mandates a proper cumulative effects assessment at an appropriate range of spatial and temporal scales, and inclusive of relevant land uses competing for resources on an overlapping landscape. Assessed against these benchmarks, the cumulative effects assessment prepared by Beacon's consultant is profoundly incomplete.

It is my opinion that Beacon's cumulative effects assessment is generally deficient with respect to key requirements described in Bulletin 2025-12, including but not restricted to the following:

- Ignored relevant land uses at the regional study scale in terms of cumulative interactions for key input commodities (water, land) or exceedances of noise, light, or air emissions.
- Did not include temporal modelling tool analyses (i.e., cumulative effects modelling) to assist stakeholders in understanding key spatial-temporal dynamics that would profile potential conflicts but also provide opportunities for identification of, and deployment of best management practices (BMP).
- Restricted their AI/DC scope to the single Indus AI/DC project even though multiple existing AI/DC and additional proposals already exist within the regional study area. Both industry and the provincial government have delivered strong messaging to Albertans that this is a rapidly growing industrial sector - and as such, Albertans deserve to understand both the short-term and long-term benefits and liabilities.

Preface

Within the rapidly evolving arena of ***Information Technology,*** the global convergence of generative Artificial Intelligence (AI), data analytics, large language models, cloud computing, machine learning, and data centers now represent the single largest investment of global risk capital – estimated cumulatively at $7 trillion US by 2030 (McKinley and Company, 2026), of which most investment is directed to AI projects such as that proposed for Beacon s Indus AI campus (Beacon 2026). This global investment sector is actively seeking receptive cool-climate geographies characterized by abundant and cheap fuel stocks (primarily natural gas), deregulated electrical markets, favourable corporate tax environments, and proximity to large communities in which highly trained workforces prefer to live. The major urban hubs of Alberta excel in each of the criteria listed above.

The Government of Alberta (GoA) is aggressively promoting the province as a premier global hub for artificial intelligence/data centers (AI/DC), aiming to attract $100 billion in infrastructure investments by 2030 (Government of Alberta, 2026a, Government of Alberta, 2026b). A recent (2026) GoA promotionnas document entitled: Alberta s AI Data Centre Strategy sets the path to securing the province's position as the most attractive jurisdiction to build AI/DC in North America. As illustrated in Figures 1 and 2, Alberta has successfully attracted the largest number of AI/DC proposals of all provinces in Canada.

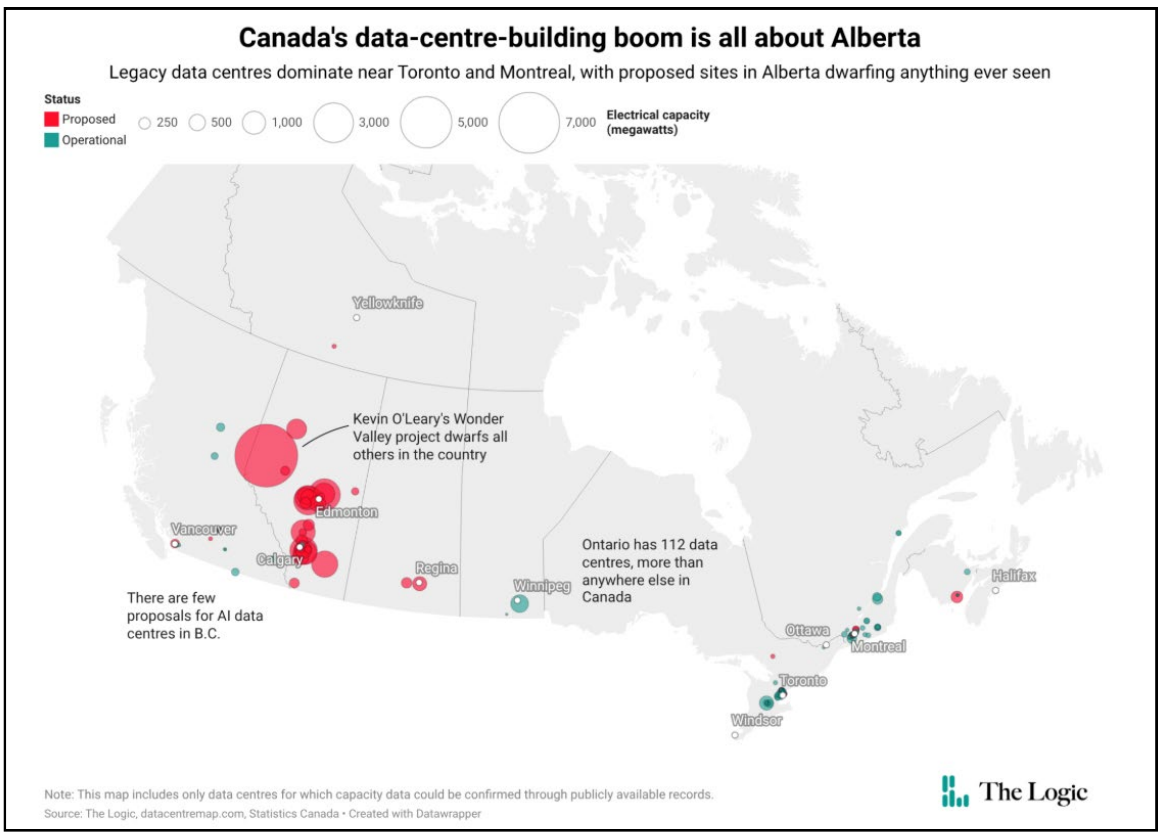

Figure 1. Canada's data center building boom is all about Alberta. Source: https://thelogic.co/news/the-big-read/data-centres-artificial-intelligence-canada-map/.

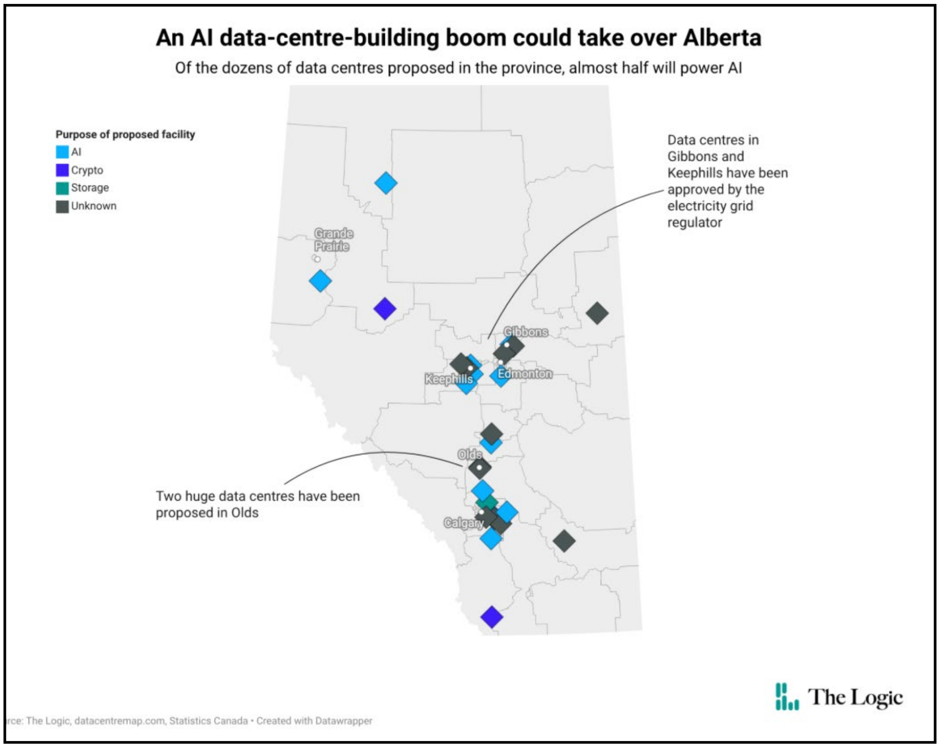

Figure 2. Location of AI data centers within the province of Alberta.
https://thelogic.co/news/the-big-read/data-centres-artificial-intelligence-canada-map/.

The global AI/DC dynamic is comparatively new, but one of explosive growth. It will take decades before the full extent of its benefits and liabilities can be fully understood, but numerous studies have revealed significant adverse effects that are well documented in those jurisdictions that have already experienced AI/DC growth trajectories. These risks are comprehensively summarized by a recent report prepared by the United Nations University for Water (Aczel et al., 2026). Although there are regional differences in how these effects manifest themselves, there are a core set of adverse effects that seem universal to all AI/DCs and often generate profound disharmony within local and regional communities. The most common of these documented adverse effects include:

- Increased Water Demand leading to increased water scarcity within natural systems (lakes, rivers, watersheds) and land uses dependent on water
- 24/7 Noise Pollution, including background hum, leading to hearing loss, insomnia, anxiety, cognitive impairment
- Light Pollution leading to loss of dark sky aesthetics
- Air Emissions (NO_x, CO, particulate matter (PM) 2.5) leading to elevated GHG emissions, and health complications (respiratory and cardiovascular disease)
- Depressed Real Estate Values, leading to losses in home equity

It is not surprising that the local landowner/stakeholder Group (Indus and Area Residents Group (IARG)) have expressed grave concerns about the unwanted consequences of an immense AI/DC facility embedded within their community (Impact Assessment Agency of Canada, 2026). Numerous communities elsewhere in North America have already experienced these adverse effects (Mineo, 2026) and are increasingly raising their concerns.

Projects such as Beacon s Indus AI/DC should be viewed as analogous to Alberta's legendary Leduc #1 oil well, which heralded the arrival of a nascent hydrocarbon sector that fundamentally transformed the province's socio/economic/environmental landscape in the 1940 s. During the past several decades, the economic benefits of the oil and gas sector in Alberta have been profound and only equaled by the intensity and magnitude of the environmental liabilities it has created. It took many decades before Alberta's governance and regulatory bodies were prepared to recognize that the hydrocarbon sector created both benefits and liabilities. To many Albertans, a balanced discussion about this sector has still not yet occurred.

What remains to be seen is whether Alberta s regulatory arena will mandate a balanced and thorough dialogue about this fledgling, but rapidly growing AI/DC industry that is highly likely to dominate the province s socio-economic, industrial and natural capital landscape for the next century. Once Beacon has completed its proposed complement of 4500 megawatt $10 B announced AI/DC projects in Alberta, their electrical consumption alone will represent ~1/3rd of the entire electrical load in the province. Moreover, there are over 40 different AI/DC proposals currently being reviewed by the Alberta Electric System Operator (AESO, 2026), which if approved, would double the province's electricity demand and production.

AI/DC are among the most intensive and resource dense industrial features on Earth (Hanwha, 2025) – their local density of concrete, metal, heat, electricity, water, sound, cooling, and embedded investment capital ($/m^2) is almost unparalleled. Given the immense and growing societal appetite for AI technologies, these energy-dense campuses are quickly becoming common industrial features in both urban and rural landscapes.

The myriad consequences (economic, environmental, social) of this new technology are nearly impossible for the average stakeholder to grasp (World Resources Institute, 2026). Only through a robust, systems-based cumulative effects approach, can the full suite of benefits and liabilities of this emergent tech sector be understood at spatial scales that range from local to regional, and temporal scales from now to future (multigenerational). To date, no such analyses has been completed in Alberta. Yet, it is clear that the intent of AUC Bulletin 2025-12 requires a thoughtful, strategic, and integrated approach to cumulative effects assessment when considering proposals such as Beacon's Indus AI/DC project.

Beacon s cumulative effects review generically portrays a single AI/DC event (Indus campus) with minimal or no significant effects with other land uses, valued components (VC), or valued ecosystem components (VECs) when spatially diluted across a large regional study area (Rocky View County). In my view, the narrow and exclusionary approach adopted by Beacon's cumulative effects report limits its value to being a cursory overview, and not a legitimate attempt at addressing the important topic of cumulative effects assessment.

Although the GoA (Alberta Land Use Framework) and AUC (Bulletin 2025-12) mandates cumulative effects assessments for various industrial project types, they do not prescribe detailed methodologies about how these assessments are to be completed. It is left to the discretion of the project proponent, and their consultants, to devise and defend the details and selection of VC, VECs, sampling intensity, spatial scales, and which land uses to include or exclude in their analyses. Equally important, it is at the discretion of the proponent and consultant about what time period (temporal domain) to explore. Although it is explicit that natural capital domains of wildlife, vegetation, air, and water are to be addressed, it is the purview of the proponent (through the decisions of their consultants), to determine the critical decisions about spatial and temporal scale that ultimately determine the results of the analyses, and the messages they convey to stakeholders and regulatory bodies.

In reality, the GoA provides general guidelines to industry concerning cumulative effects assessments, implying that industry has the capacity to complete the analyses in a thorough and unbiased manner. Industry, in turn, completes analyses that are often incomplete and/or misleading, and then defends these analyses by stating they meet the minimal standards as laid out by the GoA. If critical scoping boundaries, system complexities and spatial and temporal scales are not appropriately determined, then the opportunity for affected stakeholders and the public to become informed about the cumulative liabilities of the project are negated. All too often, biased selection of spatial and temporal boundary conditions magnifies the benefits of proposed projects while minimizing any opportunity for stakeholders to grasp the full magnitude of liabilities.

Conducting a Cumulative Effects Assessments

I agree with the definition of cumulative effects as described by Joseph et al. (2023):

Cumulative effects (CEs) are typically defined as the combined effects of past, present, and potential future human activities and other stress on environmental, economic, social, and other values. CEs have long been a focus of major project impact assessment (IA), with early conceptualization and cementing of their role in project-level IA in the US groundbreaking National Environmental Policy Act (NEPA) of 1970 and following suit in many jurisdictions around the world including Canada (Olagunju et. Some maintain that CEs are ultimately the only effects worth assessing (Duinker and Greig, 2017).

Although the structure and methodologies of proper cumulative effects assessments have been widely described (Joseph et al., 2023), they are seldom endorsed or conducted in Canada by provincial or federal governments/agencies charged with sustainable resource mandates. A recent review by the Council of Canadian Academies (2019) entitled Greater Than the Sum of Its Parts: Toward Integrated Natural Resource Management in Canada, highlights the need for a fundamentally new approach to examining sustainability on regional landscapes shaped by multiple overlapping land uses.

There are several reasons why government and industry likely resist adopting the foundational principles of cumulative effects assessments, but arguably the most important reason is fear that its methodological outcome would reveal the magnitude of environmental liabilities, and that this knowledge might interfere with capital investment or economic growth. Because of persistent tendencies to externalize the economic or intrinsic value of natural capital, many in government and industry struggle to understand that sustainable management of ecosystems is fundamental to securing long-term economic prosperity. This puts them at odds with embracing the principles of rigorous cumulative effects assessments. A contemporary and timely example of the lack of a proper cumulative effects ideology is how the Government of Alberta has framed the conversation about the rapidly growing an AI/DC industry.

Four of the hallmarks of proper cumulative effects assessments relate to systems integration, multi-stakeholder participation, spatial scale, and temporal scale. If assessments of AI/DC do not adequately address all of these interacting benchmarks, then there cannot be an informed conversation about both the benefits and liabilities of this fledgling, but rapidly expanding sector. If these principles are ignored, then the natural capital accounts (air, water, carbon, soils, biodiversity), human health, and other land uses of Alberta are placed at risk.

Systems Integration

The watersheds and landscapes of Alberta are complex biophysical systems, complete with physical, biotic, human, and land-use components and their myriad inter-actions. We often view these systems through the separate and isolated lens of social, economic, and environmental performance. These components interact in ways we understand and in ways we do not. Altering one or more of the system components will invariably cause others to adjust and respond. And there are innumerable lags in how quickly these systems respond and interact. There are many hundreds of components to these social/economic/environmental systems and many tens of thousands of interactions. To date, a systems-based approach to examining AI/DC against the full suite of land uses has not been completed. Given the important role that watersheds, airsheds and their constituent elements (water quantity, water quality, air chemistry, carbon movement, biodiversity, ecosystem connectivity) it is certain that a rapidly expanding network of AI/DCs will affect most, if not all biophysical components of the natural capital accounts of Alberta. The materials submitted as part of Beacon's Indus AI/DC adopts a narrow silo approach that does not reflect the integrated system in which this proposal intends to be placed. As such, it is not possible to understand how the Indus AI/DC is likely to interact with other land uses (residential, irrigation, crops, livestock, recreation), human health (air, light, and sound pollution), and key ecosystem dynamics that involve air quality, soils, carbon pools, water (quantity and quality), and biodiversity.

Multi-Stakeholder Inclusivity

Cumulative effects assessments recognize and incorporate all land uses (land users) affecting a regional watershed or airshed, and as such all stakeholder groups need to be part of the discussion that identifies performance indicators (social, economic, environmental), to assist in selecting "what-if" scenarios to be explored, and to inform relevant spatial and temporal scales of the project. Should the Government of Alberta fail to recognize this key principle, a loud response from awakened Albertans is a likely outcome. The existing silo, project-by-project consultation process is not in any way a defensible cumulative effects approach, but does hopefully set the stage for initiating one.

Meaningful Spatial and Temporal Scale

What is clear is that the Government of Alberta wishes to see a large AI/DC network emerge within the province. This magnitude of this policy direction has been well documented through an examination of current promotional material on both GoA (Alberta's 'Artificial Intelligence (AI) Data Centres Strategy: Powering the Future of Artificial Intelligence, 2026) and private sector websites. Despite this information, the Government of Alberta and AUC has to date confined its regulatory dialogue on cumulative effects to isolated AI/DC proposals. This narrow focus precludes the broader stakeholder community from a robust opportunity to understand the full suite of benefits and liabilities that would attend such an extensive, transformational and disruptive land use trajectory as that AI/DC. A broader analytical scope, one that considers an appropriate range of space (small to large) and time (short-term to long-term) is critical to ensuring that the full breadth of learnings of cumulative effects is made and conveyed to Alberta's stakeholders.

The appropriate time" scale for robust cumulative effects assessment is one that allows the current and foreseeable projects to unfold in relevant temporal and spatial scale. AI/DC proponents (Government of Alberta, private sector investors) wish to develop and implement a new and expansive AI/DC network that would generate significant employment and tax revenue, and position Alberta in the forefront of the information tech frontier. But in doing so it will also transform hundreds of square kilometers of natural and anthropogenic landscape, consume significant volumes of scarce water, electricity, and fuel, emit large volumes of GHG, particulates and $N0_x$, and generate noise pollution well beyond their physical footprints. This is the classic benefit and liability dynamic that attend all land use considerations.

Spatial/Temporal Optimization and Best Management Practices

A key benefit of a thorough and comprehensive assessment of AI/DC sector would be the spatial/temporal insight into what are the key social, economic and environmental issues, where do these issues emerge, which BMPs would offer greatest mitigative benefit, and how to optimize the spatial and temporal distribution of those AI/DC. Only by simulating a range of AI/DC scenarios is it possible to quantify its effects on key VCs, and to explore how different BMPs assist (or not) in the performance of VCs.

AUC Bulletin 2025-12

The wording in AUC's Bulletin 2025-12 is clear. Appropriate and robust cumulative effects assessments are a requirement for all large power plants and energy storage facilities. Further, the Bulletin 2025-12 identifies key considerations and refers to the need for careful scoping of space (spatial) and time (temporal) domains. AUC's Bulletin 2025-12 reads as follows:

The AUC has considered the guidance from the Ministry of Affordability and Utilities and is introducing the following interim information requirements for all types of power plants and energy storage facilities that are 10 megawatts or greater, with a new application filed on or after August 26, 2025:

1. *Please confirm whether the applicant is aware of other existing developments in the project area that could cumulatively affect the rural setting/landscape due to their proximity and/or number.*
2. *Please discuss any potential positive or negative cumulative social, economic or environmental impacts or effects that may occur considering the proposed project, existing developments and any other currently planned developments. This discussion may include, but is not limited to, any economic spinoffs, community and employment benefits, visual impacts, proliferation, land fragmentation (including fragmentation of agricultural uses, wildlife habitat fragmentation, etc.), the impact of adherence to municipal planning documents, wildlife, species at risk, air quality impacts, recreational or tourism impacts, impacts to existing or anticipated resource development, wetlands, native grasslands, watersheds and water quality impacts, and surface management.*
3. *3. Please discuss the applicant s alignment, or efforts to align, with Alberta s Land-use Framework and the economic, orderly and efficient development of industrial facilities including efficient land use principles.*

With respect to requirements #1, #2, and #3 above, the following deficiencies in the Beacon/Stantec cumulative effects review have been identified.

1. Deficiencies relating to Requirement #1, where the proximity of Calgary to the Indus is not meaningfully discussed in either a spatial or temporal manner.

    - The Proponent chose the airshed of Lethbridge and Brooks as a more favourable comparison for their air quality analyses involving the Indus plant. This decision does not make sense as these are much smaller communities and do not reflect the regional airshed dynamics of the Indus site and its position within the Greater Calgary region. Calgary is primarily upwind of the local study area and as such the local study area would be subjected to air emission dynamics from both local and upwind sources of emissions. Equally, the City of Calgary will be affected by the suite of emission types produced at the proposed Indus site.

    - The Proponent's submissions fail to meaningfully recognize that the proposed Indus site is geographically proximal to the City of Calgary, the largest of Alberta's cities with an urban footprint (~900 km^2) that has grown spatially at ~2%/year over the past several decades. As described in the document "Guiding Calgary's Growth; Area Structure Plans (2026), Calgary is expected to continue to grow at an exponential rate and the southeast region will experience significant new community growth. Given the annexation history of Calgary into adjacent Rocky View County lands, it only stands to reason that the City of Calgary will eventually consume the land around the proposed Indus AI/DC. At this point, the Indus AI/DC will be functionally inside Calgary's boundary. This high probability reality deserves in-depth cumulative effects analyses with respect to the following dynamics:

        1. Heat Island Effect
        2. Residential Property Value and Viewscape

3. Noise Pollution
4. Competitive Water Demand
5. Water Quality
6. Air Quality
7. Light Pollution

2. Deficiencies relating to Requirement #2, where the full suite of existing land uses are not addressed meaningfully in either a spatial or temporal manner.

   - The Beacon Indus site is situated within a large and busy regional landscape that includes a broad suite of existing land uses (urban residential, acreage residential, agricultural residential, croplands, livestock pastureland, recreation, light industry, mining, oil and gas). Each of these land uses contains a land footprint, requires a large set of input streams (air, water, electricity, fuel, services, transportation, public and private infrastructure) and generates an equally large set of outputs (commodities, waste streams, expired capital). By all measures, the AI/DC dynamic is an explosive and new trajectory. The Indus campus alone will affect both input and output dynamics of all surrounding and regional land uses. It is the job of a robust cumulative effects assessment to quantify and describe these interactions. Only by doing this work in a comprehensive manner can the full suite of benefits and liabilities be understood. If the full extent of spatial and temporal liabilities are not identified, it is impossible to consider a full complement of mitigation measures intended to optimize the benefits and minimize the liabilities. I see no evidence that Beacon and Stantec have completed this important work.

3. Deficiencies relating to 3. *No meaningful efforts made to align with the South Saskatchewan Land Use Framework.*
   - The Alberta Land-use Framework (LUF) and its South Saskatchewan Regional Plan (amended 2025) identifies the South Saskatchewan Region as facing severe growth pressures from rapidly increasing human population and expanding land uses. Key environmental challenges include acute water scarcity and allocation limits, habitat fragmentation from linear infrastructure, wetland and riparian degradation, and cumulative impacts on air and water quality. The Alberta Land Use Framework explicitly states that cumulative effects assessments should be completed to assist locals, regional, and provincial stakeholders in comprehending the full breadth of benefits and liabilities associated with land uses.

To emphasize the limitations described above in greater detail, and to suggest BMP recommendations, I offer additional comments referring to deficiencies of Beacon's cumulative effects review below.

Temporal Scale

- Beacon's analyses did not consider any future AI/DC projects even though there is abundant published information that there will be numerous other AI/DC proposed projects at the scale of the selected regional study area (Rocky View County). Nor did they consider existing AI/DC (E-Struxture 2 and E-Struxture 3) in the regional study area. These omissions negate any opportunity for stakeholders to appreciate how the known or anticipated growth trajectory of AI/DC will affect VCs.

For example, if the AI/DC trajectory grows within the regional study area at a rate promoted by the GoA and the industrial sector, how does it adversely affect the following key environmental VCs:

  - Water Availability Index for other key water users (in-stream, domestic human, crops, livestock, recreation, other industrial sectors).

    - Key Questions:

        - Given the growth trajectory of each of urban residential, rural residential, agriculture, heavy industry, light industry, recreation, and AI/DC, how quickly may water shortages emerge, and which land uses are most likely to experience water shortages?

        - How does a rapidly expanding network of AI/DC affect water availability for scenarios that incorporate climate change predictions?

- Air Quality Index through Heat Island Effects leading to increase frequency and magnitude of heat stress to local and regional populations.

    - Key Questions:

        - What is the total cumulative heat load of all land uses in the regional landscape? What is its spatial distribution?

        - To what extent does a growing population of AI/DC contribute to increased heat load over the next 2-3 decades.

        - As the Indus and other AI/DC located adjacent to, and within the Greater Calgary region grow in number, do they acerbate concerns of urban heat stress?

        - How is this elevated heat island dynamic likely to affect the health of people residing in the Greater Calgary region?

- Ambient Noise Quality Index through increased frequency and magnitude of noise pollution (primarily low-frequency) that reduces quality-of-life metrics

    - Key Question:

        - Given the anticipated number (low, medium, high) of new AI/DC in the regional study area, what is the combined acoustic load and what is the spatial distribution of that load?

- Landbase Index for wildlife habitat and productive cropland, through loss from land conversion

    - Key Question:

        - To what extent has natural habitat, and connectivity of habitat been lost by all land uses to date? What is the spatial distribution of the remaining habitat that provides connectivity? How might the anticipated number (low, medium, high) of new AI/DCs in the regional study area affect the remaining vestiges of unfragmented habitat? Which wildlife species are most affected by an increasingly fragmented landscape? And how well might BMPs alleviate habitat loss?

Exploring meaningful temporal boundaries can also reveal consequences to non-environmental VCs, such as economic, social and aesthetics:

- Property Values of nearby neighbourhoods

- Employment (both construction and permanent jobs)

- Human Health and Community Well-being

Dilution of Spatial and Mathematical Scale

The documents provided by Beacon's consultant adopt spatial decisions that are misleading in terms of allowing stakeholders to appropriately understand the magnitude of adverse effects of this project. Below are a few examples. Although the commodity consumption rates (water, electricity, land area) and output rates ($C0_2e$, NO_x, PM 2.5) are provided by the proponent in their submissions, these metrics are generally profiled in summary comments as a minor or insignificant level when compared to the full suite of other land uses occurring on a large regional study area (generally Rocky View County) or other regional study area). This wording fails to capture the magnitude of the local effect and leaves the reader with the understanding that additive effects are insignificant.

One of many examples includes messaging around air emissions that highlight this written bias. Table 1 lists the existing $NO_{x,}$ CO, and PM 2.5 loads (tonne/day) from emitters currently in operation or approved in the regional study area, with values (tonne/day) of 7.18, 1.93, and 0.235, respectively. As shown in Table 4.9, the additive new emissions of $NO_{x,}$ CO, and PM 2.5 from the Indus Project alone are 3.09, 2.14, and 0.491 tonne/ day, respectively. These are profoundly large additions to the background levels. Rather than stating mathematically the relative increase of these emissions relative to background levels (i.e., stating the % increase that these new additions would create; for example, adding a value of 1.0 to an existing level of 1.0 equals a 100% increase), the Beacon submission

Table 1. Comparison of air emission loadings.

Emission Loads (tonne/day)			
	N0x	**CO**	**PM2.5**
Base Case	7.18	1.93	0.235
Project Case	3.09	2.14	0.491
Application Case	10.26	4.08	0.726
Contribution of Project to Application Case	30.1%	52.6%	67.6%
Actual Increase in Emission Load	43%	111%	209%

choses to add background levels to project case first, and then reflect on what "fraction" the new value adds, which suggests a much lower increase. Which is the same as saying a 1.0 addition to an existing 1.0 value only reflects 50% of the total load. A 50% value sounds much less adverse to the reader than 100%, and while mathematically correct, I believe it is misleading. A comparison of the Beacon approach and a more informative approach is highlighted above in Table 1. To the average stakeholder, 30% sounds less adverse than 43% (for NOx), 53% sounds less adverse than 111% (for CO), and 68% sounds less adverse than 209% (for PM 2.5)). Both approaches are mathematically correct but convey entirely different messages to a public who wishes to be informed about the magnitude of new emissions associated with this proposal.

Curiously, these large increases in combined local and regional emission loading from the addition of the Indus project were not included in the Executive Summary dealing with air quality. Instead, the authors chose to focus on maximum emission concentrations, which reflect a spatial dilution dynamic associated with plume modelling:

The maximum predicted NO_2, CO, and PM 2.5 concentrations for all averaging periods associated with the Base Case and Application Case are below the AAAQO. A comparison between maximum predicted concentrations for the Base

Case and Application Case indicates small increases (up to 0.8%) to the maximum predicted NO_2, CO and PM2.5 concentrations with the addition of the Project. The modelling results show that overall maximum concentrations in the study area are primarily attributable to emissions from the existing regional industrial facilities. This summary in no way conveys the large additive loading for each of *NO_x, CO, and PM 2.5 from the Indus project, and nor does it reflect any scenarios where there is more than one AI/DC being developed*.

AI/DCs, Climate Change and Global Heating

Perhaps the ultimate cumulative effects questions to be pondered by governance and regulatory bodies regarding AI/DC should focus on its potential contributions to climate change and its encompassing threats to humanity. The driving force behind climate change is the vast volumes of hydrocarbons combusted to fuel human land uses. Climate change is driving significant weather extremes in Alberta, including hotter and more frequent heatwaves, intense droughts, severe flash floods, and larger, more volatile wildfire seasons.

The Canadian Climate Institute (2026), Alberta Climate Futures (2019), and ABMI (Schneider (2013) have published regional assessments of climate change futures for Alberta. These publications underscore the increasing magnitude and frequency of heat waves and water scarcity that await Alberta in the decades to come. The GoA leadership and its ministries now recognize the gravity of the climate change challenge being experienced at all spatial scales. Given that the majority of Albertans reside in urban centers (such as Calgary), how will the rapid increase in number of AI/DCs interact with, and contribute to, high temperature climatic events within existing urban heat islands? What are the health and electrical (cooling) implications of these events?

While AI/DCs are currently responsible for ~1-2% of global electricity consumption and GHG emission, they are currently growing their electricity demand at 30%/yr (International Energy Agency, 2026). Globally, if this sectoral growth rate persists for the next few decades, AI/DC would quickly become an insurmountable obstacle to achieving existing international GHG emission reduction goals (Center for Biological Diversity, 2025). At a provincial scale Alberta is already struggling with public concerns relating to AI/DCs and their demands/intake/emissions of GHG, electricity, water, heat production, and harmful noise.

If Alberta's AI/DC growth trajectory unfolds at these hyper-exponential rates, its adverse effects would be massive, as would be the vocal opposition of affected communities. Given the spectre of rapid AI/DC growth in the Greater Calgary region, it would be advisable for the AUC to recommend a cumulative effects assessment strategy to seek answers to the following issues and questions:

1. Surging Greenhouse Gas Emissions

- **Massive Energy Draw:** Modern hyperscale AI/DC consume vast amounts of electricity. Alberta is proposing some of the largest AI/DC ever considered. Training and operating large language models require computing power equivalent to the needs of tens of thousands of homes. [Lincoln Institute of Land Policy (2026), Penn State Institute of Energy and the Environment, 2026]
    - What are the likely projections of electricity consumption, and related GHG emissions, associated with the training and operating of LLMs proposed by Beacon's Indus project and other AI/DC currently proposed in the region?
- **Fossil Fuel Reliance:** Many AI/DC are built in regions where the electrical grid is still powered by coal and natural gas. This is the situation that occurs in Alberta. This fuel dependence directly releases large quantities

of carbon dioxide, exacerbating climate change. Many proposed facilities, including those in Alberta intend to install on-site gas turbines for continuous, independent power. From a climate change perspective, it would be preferable to locate AI centers in cooler regions or areas with low-carbon, renewable power grids (such as areas utilizing hydropower; David Nutt, Cornell Chronicle 2025).

- Is it within the mandate of AUC to consider issues relating to the optimal geographic location of AI/DCs? If so, how does the proposed location of the Indus AI/DC rank relative to other sites?

2. High Water Consumption and Scarcity

- **Cooling Demands:** Enormous volumes of water are required to absorb the heat generated by AI servers. Large facilities can consume millions of litres of water daily, equivalent to the usage of a small to medium sized town. Even with closed loop glycol systems to cool computer components, it is necessary to generate vast quantities of electricity to power the movement of the cooling fluids.

- **Local Strain:** Many AI/DC are situated in water-scarce regions, creating direct competition with local communities for dwindling freshwater resources. The Indus AI/DC is located within the South Saskatchewan watershed, a basin closed to additional water allocations and one in which water scarcity is expected to become more pronounced. (Government of Alberta, 2009).

  - The South Saskatchewan River watershed is already fully allocated with respect to water demand. What assurances exist that future AI/DC in this watershed will not lead to higher cumulative water demand across all land use sectors, and place further demands on a watershed struggling to meet its existing water allocation commitments?

Exploring Temporal and Spatial Dynamics

The current Indus AI/DC project is contextualized in Beacon's Indus AI/DC submissions primarily as a single event with minimal or no significant cumulative effects at the scale of Rocky View County. While it is true that its projected individual footprint and resource demands and emission streams may be comparatively less than combined industrial activities currently in Rocky View County, this comparison is not instructive to stakeholders such as the IARG and other stakeholders in understanding how the emerging AI/DC sector contributes (adds to) cumulatively the existing full complement of other land uses (croplands, pasture lands, oil and gas, mining, residential, recreation, light

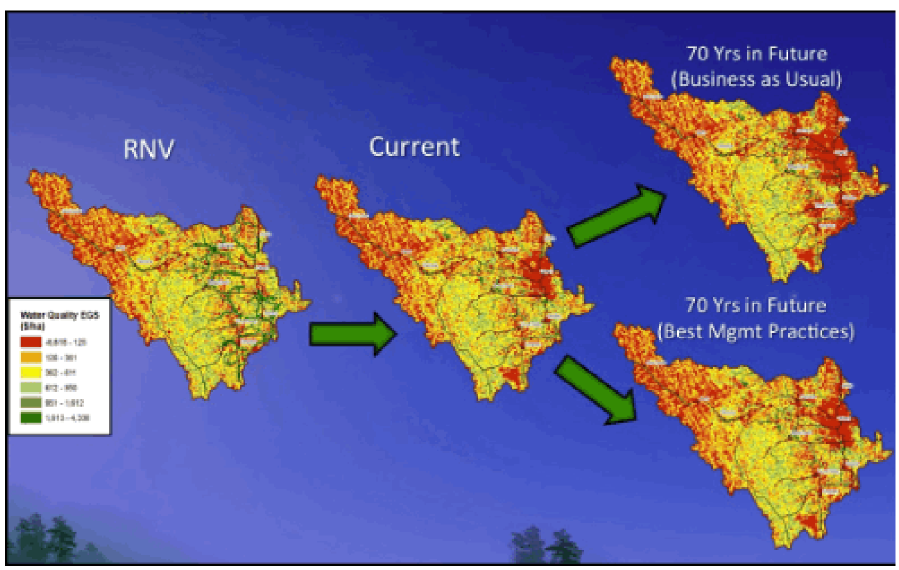

Figure 3. The Upper Bow River Basin in Alberta. This map illustrates changes in water quality, which is a reflection of land use intensity. The proposed Indus data center is at the very lower reach of this watershed. Source: Alces Group.

industry), with respect to the key VCs of water, land, GHG emissions, electricity load, and transmission network - both now and in the future.

The Indus area is located at the very downstream extent of the Upper Bow River Basin (Figure 3), a high-profile provincial watershed that currently contains an exceptionally busy matrix of people and land uses (urban residential, rural residential, croplands, grazing lands, light and heavy industry, oil and gas, logging, transportation, recreation, mining, etc.). It has experienced profound land use and landscape changes in the past century and is expected to undergo additional population land use growth in the next 70 years. Each of these land uses produces commodities (homes, wood, fuel, food, aggregate, recreation, transit), and each requires energy. The production of that energy requires land, water, an upstream energy source, infrastructure, and affects key natural capital categories (water quality, water quantity, biodiversity, air quality. What might this trajectory look like under a variety of "what-if" scenarios relating to the future of AI/DCs? Careful consideration of an AI/DC trajectory needs to minimally consider the following questions:

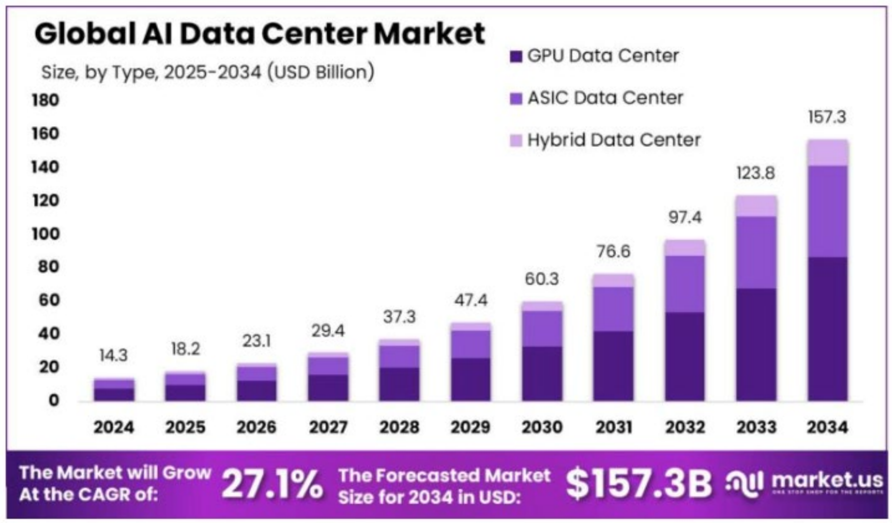

Figure 4. Historical global AI Data Center Market. Source: https://market.us/report/ai-data-center-market/

- What are the natural and human capital input requirements for electricity, land, water, transportation, work force, …, required for a typical AI/DC campus, such as the one proposed by the Beacon for Indus?
- Does the Indus AI/DC project represent a "one-off" event, or is the Indus proposal a harbinger of numerous proposals in the next few decades? What is a likely growth rate of this sector over the next 20-30 years? - the timespan for our children to attain our age. That Beacon has proposed 3 AI/DC for the Greater Calgary region provides some relevant insight into this question. This sector is growing at 24-28%/yr globally, 23%/yr in North America, 25%/yr in Canada (Fortune Business Insights, 2026), and even higher hyper-exponential growth in Alberta. These growth trajectories will manifest themselves both qualitatively and quantitatively in water consumption, sound and light emissions, land occupation, electrical load, and GHG emissions. Key questions that need to be answered include:
    - At a range of spatial scales (municipal, provincial) what regions in Alberta are best suited to meet these requirements? For example, is a BYOE (bring your own electricity) strategy likely to be successful in all regions? And if not, what existing electrical use clients and sectors are likely to be adversely affected?
    - What are the key conflicts (water quantity, water quality, land, noise pollution, aesthetics, GHS emissions, wildlife conservation) between AI/DCs and the existing matrix of land uses? Which spatial regions do these conflicts occur with greatest intensity? What are the best management

practices that alleviate key issues, and to what extent do these mitigation work? How costly are these mitigation and do the requisite technologies even exist to allow industry to implement them?

IARG members understand the importance of conducting cumulative effects assessment, as revealed in the words of landowners Arnold and Johanna Heuver in their AUC submissions:

> *"The project is close to a big city that is already producing and sending pollutants into the air. How many power plants, including AI data centers, are we going to have in very close proximity? The combined pollutants are a very big concern for us. Chestermere Beacon AI Center, which will include another gas fired power plant, is only about 5 km away. Now there is another proposal from Wild Rose West AI which is about 5 km east of this project. The cumulative effects of these projects should be carefully considered"*

A rapidly increasing number of Albertan's are asking the same question about AI/DCs. And their questions remain unanswered. So, let us try to gain a preliminary insight into the Heuver's reasonable question with a simple exercise in cumulative effects assessments that explores the spatial and temporal magnitude of this nascent land use.

Starting with just a single AI/DC similar in scale to the Beacon Indus project (10.5 M MWH/yr, 500,000 m^3 of water/yr, 350 ha of landbase, 4.78 M tonne of CO_2e/yr) how might a no-growth (0%/yr), medium growth (7%/yr), and high trajectory (15%/yr) affect a regional study area of the scale of the Greater Calgary Metropolitan region and its surrounding Rocky View County.

The no growth, medium and high growth trajectories are presented in Table 2 for a few key VCs. A 0% growth in AI/DC is reflected in the first row of each spreadsheet, and these numbers would not change with time. At year 20, a 15% annual growth rate (which is lower than the actual rate Alberta is currently receiving new AI/DC proposals), projects in 20 years a total of 14 AI data centers occupying 5,000 ha (~20 sections) of land, consuming 150 million MWH of electricity/year, emitting 68 million tonne of CO_2e/year, and consuming over 7 million m^3 (7 billion liters) of water/year.

These are staggering large values. In comparison, in 2025, the City of Calgary consumed ~182 M m^3 of water and 18 M mwh of electricity and emitted about 15 M tonne of CO_2e/yr.

- This means that a 15% growth rate in AI/DC (i.e, 14 data centers in 20 years) would lead to an outcome where AI/DCs would be consuming more than 8 times the current electricity consumption of the City of Calgary, would emit more than 4 times their amount of GHG, and would be consuming nearly 5% of the water currently used by the City of Calgary. This exercise underscores the importance of running "what-if" AI/DC scenarios across meaningful time (multiple decades), meaningful space (Greater Calgary region) and assessing meaningful growth envelopes of AI/DCs (low to high). The results make clear that the Indus project, and the ones that are likely to follow, will have a significant adverse effect on loss of remaining wildlife habitat and high-value agricultural land, availability of an already scarce water supply, and will represent a massive increase in the emissions of GHGs and consumption of electricity.

Table 2. Projected changes in selected VCs under a low (7%/yr; left) and high growth (15%/yr; right) trajectory

	Growth rate	0.07			
Year	**# AI/DC**	**Water (m3/yr)**	**Electricity (MWH)**	**Land Area (ha)**	**GHG Emissions (t CO2e)**
1.00	1.00	500,000.00	10,500,000.00	350.00	4,780,000.00
2.00	1.07	535,000.00	11,235,000.00	374.50	5,114,600.00
3.00	1.14	572,450.00	12,021,450.00	400.72	5,472,622.00
4.00	1.23	612,521.50	12,862,951.50	428.77	5,855,705.54
5.00	1.31	655,398.01	13,763,358.11	458.78	6,265,604.93
6.00	1.40	701,275.87	14,726,793.17	490.89	6,704,197.27
7.00	1.50	750,365.18	15,757,668.69	525.26	7,173,491.08
8.00	1.61	802,890.74	16,860,705.50	562.02	7,675,635.46
9.00	1.72	859,093.09	18,040,954.89	601.37	8,212,929.94
10.00	1.84	919,229.61	19,303,821.73	643.46	8,787,835.04
11.00	1.97	983,575.68	20,655,089.25	688.50	9,402,983.49
12.00	2.10	1,052,425.98	22,100,945.50	736.70	10,061,192.33
13.00	2.25	1,126,095.79	23,648,011.68	788.27	10,765,475.80
14.00	2.41	1,204,922.50	25,303,372.50	843.45	11,519,059.10
15.00	2.58	1,289,267.08	27,074,608.58	902.49	12,325,393.24
16.00	2.76	1,379,515.77	28,969,831.18	965.66	13,188,170.76
17.00	2.95	1,476,081.87	30,997,719.36	1,033.26	14,111,342.72
18.00	3.16	1,579,407.61	33,167,559.72	1,105.59	15,099,136.71
19.00	3.38	1,689,966.14	35,489,288.90	1,182.98	16,156,076.28
20.00	3.62	1,808,263.77	37,973,539.12	1,265.78	17,287,001.62

	Growth rate	0.15			
Year	**# AI/DC**	**Water (m3/yr)**	**Electricity (MWH)**	**Land Area (ha)**	**GHG Emissions (t CO2e)**
1.00	1.00	500,000.00	10,500,000.00	350.00	4,780,000.00
2.00	1.15	575,000.00	12,075,000.00	402.50	5,497,000.00
3.00	1.32	661,250.00	13,886,250.00	462.88	6,321,550.00
4.00	1.52	760,437.50	15,969,187.50	532.31	7,269,782.50
5.00	1.75	874,503.13	18,364,565.63	612.15	8,360,249.88
6.00	2.01	1,005,678.59	21,119,250.47	703.98	9,614,287.36
7.00	2.31	1,156,530.38	24,287,138.04	809.57	11,056,430.46
8.00	2.66	1,330,009.94	27,930,208.74	931.01	12,714,895.03
9.00	3.06	1,529,511.43	32,119,740.06	1,070.66	14,622,129.28
10.00	3.52	1,758,938.15	36,937,701.07	1,231.26	16,815,448.68
11.00	4.05	2,022,778.87	42,478,356.22	1,415.95	19,337,765.98
12.00	4.65	2,326,195.70	48,850,109.66	1,628.34	22,238,430.87
13.00	5.35	2,675,125.05	56,177,626.11	1,872.59	25,574,195.50
14.00	6.15	3,076,393.81	64,604,270.02	2,153.48	29,410,324.83
15.00	7.08	3,537,852.88	74,294,910.53	2,476.50	33,821,873.55
16.00	8.14	4,068,530.81	85,439,147.11	2,847.97	38,895,154.59
17.00	9.36	4,678,810.44	98,255,019.17	3,275.17	44,729,427.78
18.00	10.76	5,380,632.00	112,993,272.05	3,766.44	51,438,841.94
19.00	12.38	6,187,726.80	129,942,262.86	4,331.41	59,154,668.23
20.00	14.23	7,115,885.82	149,433,602.28	4,981.12	68,027,868.47

for AI/DCs in the Greater Calgary region.

Health Effects of AI/DCs

While the Alberta Utilities Commission (AUC) does not mandate a formal, stand-alone Health Impact Assessment (HIA) for proposals such as Beacon's Indus AI/DC application, the AUC is required by law to determine if a project is in the public interest, which inherently means including assessments of health impacts. The issues discussed below were raised by the IARG and deserve quantitative assessment in a thorough cumulative effects framework. The health implications of air, light, and noise pollution are well documented. The emissions associated with the Indus plant will be additive to the existing background levels at all spatial scales (local and regional). As emphasized previously in this report, a proper cumulative effects assessment should consider the implications of a larger network of AI/DCs expected to emerge on the regional landscape over the next few decades.

Light Pollution

Light pollution is a global issue. Hyperscale data centers require 24/7 security and maintenance illumination which creates a light dome harmful to diurnal and nocturnal organisms and human health, even when mitigated by best practices. Though light intensity drops proportionally with distance, beyond the direct line of sight the decrease in intensity is slowed by dust, moisture, and aerosols, but can remain visible for up to 10 to 30 km (National Geographic, 2026. Using historical satellite imagery, the World Atlas of Night Sky Brightness, built an online computer-generated map series based on thousands of satellite photos that measures night sky light emission and intensity. Increasing nocturnal light emission increases from low (black) to high (red). The maps in Figure 5 below showcases a portion of the Greater Calgary region and includes the Indus and Langdon. The Indus community can be seen using the arrow at the bottom left-hand corner of the legend. These analyses from this Atlas indicate that nocturnal light intensity in the Indus community has increased at an average annual rate of 9.33% between 2012 and 2025.

Best practices propose amber light rather than blue, motion sensors and green roofs; however, even if facilities restrict lumens (total light output) and lux (light hitting a surface), mitigation is limited due to safety regulations, liability and security considerations, exposed industrial equipment such as rooftop fans, and the albedo from reflective industrial surfaces. The result is that if a hyperscale campus uses 500,000 lumens of tightly controlled downward security lighting, approximately 50,000 to 150,000 lumens will still bounce upward, hitting the atmosphere and generating a visible skyglow dome (Dark Sky, 2026).

Hormonal interference caused by exposure to artificial light at night disrupts circadian rhythms and melatonin production which can cause serious adverse health effects, including severe insomnia and other sleep disorders, higher rates of obesity and type 2 diabetes, stress related activity in the brain which contributes to arterial dysfunction and risk of heart attack, higher risk of depression and anxiety, and an increased risk of breast and prostate cancer (Chepesiuk, 2009).

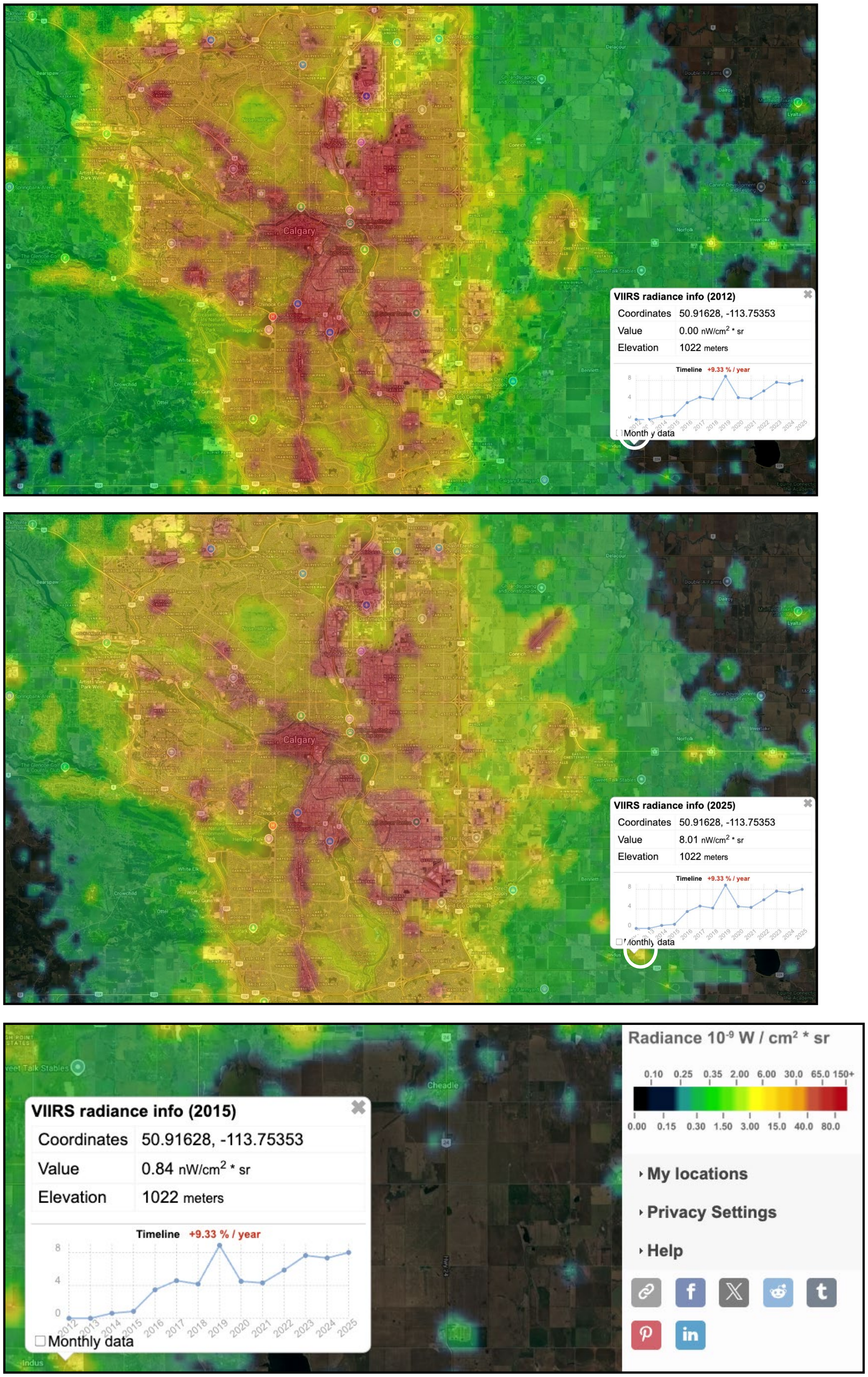

Figure 5. Changes in nocturnal light intensity in the Indus and Greater Calgary region between 2012 and 2025. Source; World Atlas of Night sky Brightness. The immediate area around the community of Indus is shown within a white oval.

Air Pollution

Hyperscale AI/DCs powered by fossil-fueled power plants and diesel backup generators emit pollutants such as nitrogen oxides, carbon monoxide, methane, volatile organic compounds, and fine particulate matter. A recent study found that these pollutants increase risk of respiratory diseases, cardiovascular conditions and cancer in nearby communities, and that U.S. data centers in 2028 could cause an additional ~600,000 asthma symptom cases and 1,300 premature deaths, exceeding 1/3 of asthma deaths in the U.S. each year, resulting in a public health burden of more than $20 billion (Han et al, 2026).

In addition to respiratory, cardiovascular and cancer risks, evidence suggests that finer fractions of PM, especially fine (PM 2.5) and ultrafine (PM 0.1) particles, adversely affect the central nervous system by penetrating the blood brain barrier which appears to increase risk of cerebrovascular and neurodegenerative diseases and cognitive dysfunction. Fine particles can accumulate and propagate longer distances, remain longer in the atmosphere and become persistent compared to larger particles (Gimeno-Ferrer et al. 2026).

Health agencies acknowledge that PM 2.5 is highly toxic and can enter the bloodstream directly and that there is no true "zero-risk" threshold. The World Health Organization considers 5 μ g/m^3 (annual average) and 15 μ g/m^3 (24-hour average) as the maximum safe levels for PM 2.5. The Canadian Ambient Air Quality Standards limit the annual average to 8 μ g/m^3 and the 24-hour average to 23 μ g/m^3. The US EPA annual standard is 9.0 μ g/m^3 and the 24-hour standard is 35 μ g/m^3.

In comparison, Alberta s allowable levels are high; the 24-hour allowable limit for PM 2.5 having been set at 29 μ g/m^3, with a 1-hour guideline of 80 μ g/m^3. The 2024 PM 2.5 data from the nearest monitoring station to the Indus AI/DC site indicates an annual average of 9.6 to 12.5 μ g/m^3, and a peak level of 20.1 to 45.8 (GoA. 2026. Fine Particulate Matter Monitoring Initiative). While these existing background levels are well within Alberta s allowable limits, they are already close to the acceptable limits of the World Health Organization, the Canadian Ambient Air Quality, and the US EPA standards.

Noise Pollution

A single INNIO Jenbacher J624 engine is a massive reciprocating machine, while clustering 20 modules proposed would create a significant cumulative noise footprint. One module (five engines) without mitigation would produce 117 decibels, and with heavy-duty acoustic baffling, industrial intake/exhaust silencers, and insulated steel walls generally emits around 75 to 85 decibels at 10 meters. Twenty modules would generate sound that will easily carry across long distances (Jenbacher, 2024). Noise emissions from a Seimens 1,034 MWe combined-cycle plant of the scale proposed will typically exceed 140 decibels at the source which can be aggressively suppressed by acoustic enclosures and exhaust silencers to 85 decibels at a distance of 1 meter from the machinery (Herring Storer Acoustics, 2025).

Industrial noise carries much further than simple distance loss formulas suggest as it has different frequencies and tonalities, including high levels of low-frequency sound and vibration below 500 Hz which can penetrate walls and produce a persistent, fatiguing drone (Žiaran et al., 2025).

World Health Organization guidelines note that nighttime noise exceeding 40 to 45 decibels inside bedrooms can cause sleep disturbance, elevated stress levels, and long-term cardiovascular risks, and continuous exposure to 55 to 65 decibels outdoor is associated with high annoyance and reduced quality of life in surrounding communities (World Health Organization, 2011).

A 2025 meta-analysis revealed that noise exposure significantly impairs cognitive performance in children and adolescents (Fernandez-Quezada et al., 2026). Another analysis of data from the China Health and

Retirement Longitudinal Study (Zhang et al., 2025) examined 3,459 individuals aged 45 and above to assess the association between noise pollution and cognitive function. The study indicated that each unit increase in the noise pollution index corresponded to a 0.41-point reduction in overall cognitive scores.

Synergistic Health Effects

Artificial Intelligence (AI) data centers generate a synergistic public health crisis. The combination of air pollution from backup generators/fossil-fuel power plants, continuous industrial noise, and intense light pollution from 24/7 exterior lighting causes compounding cardiovascular, respiratory, and neurological damage to nearby communities.

Given that all land uses emit noise, and some like AI/DCs emit extremely loud noise plumes, it would be reasonable for the AUC to request of Beacon a comprehensive cumulative noise assessment of the full matrix of local and regional land uses, and to explore the temporal consequences of the single Indus AI/DC and also a growth trajectory of AI/DCs. The health effects of this growth trajectory of noise pollution should be assessed.

Conclusions

This report focused on Stantec's cumulative effects review of Beacon's Indus AI/DC project.

It is my opinion that the expected frequency and magnitude of the nascent AI/DC sector in Alberta is immense and as such necessitates a thorough strategic-level cumulative effects assessment of this transformational land use sector. The Government of Alberta (GoA) has not completed such an assessment at either regional or provincial scale and as such Albertans remain uninformed of the full extent of the environmental and social consequences associated with AI/DCs. While numerous, promotional messages (government, industry) have conveyed the projected economic advantages (jobs, GDP, taxable incomes), there is a striking absence of information in Alberta about the adverse consequences (environmental, social, and health) caused by individual or multiple AI/DCs. It is the collective sum of these benefits and liabilities of individual and collective projects (of all land uses, properly placed in spatial and temporal scales) that constitute a proper cumulative effects assessment.

The wording of Minister Nathan Neudorf's letter (dated June 3, 2025) to Alberta Utilities Commission CEO Bob Heggie, makes clear that proper cumulative effects assessments are to be completed. Minister Neudorf stated, in part:

> *The Government of Alberta expects its agencies, including the AUC,* to consider cumulative effects and the outcomes associated with them. In addition, the Government of Alberta is committed to managing the cumulative effects of disturbance, including from electricity projects, *and remains focused on achieving strategies of Alberta's Land-use Framework*."

Without a provincial level strategic assessment of AI/DCs, its discourse by default appears to reside within the purview of the Alberta Utilities Commission (AUC) and hence discussed at an individual project scale. The AUC Bulletin 2025-12 mandates a proper cumulative effects assessment at an appropriate range of spatial and temporal scales, and inclusive of relevant land uses competing for resources on an overlapping landscape. Assessed against these benchmarks, the document prepared by Stantec does not represent a cumulative effects assessment. Rather, their document reflects a brief high-level and cursory review of the subject matter.

It is my opinion that Beacon's cumulative effects review is generally deficient with respect to key requirements described in Bulletin 2025-12, including but not restricted to the following:

- Ignored Relevant land uses at the regional study scale in terms of cumulative interactions for key input commodities (water, land) or exceedances of noise, light, or air emissions.
- Did not include temporal modelling tool analyses (i.e., cumulative effects modelling) to assist stakeholders in understanding key spatial and temporal dynamics that would profile potential conflicts but also provide opportunities for identification, and deployment of, best management practices.
- Restricted their AI/DC Scope to the single Indus AI/DC project even though multiple completed AI/DCs and additional proposals already exist within the regional study area.

Both industry and the provincial government have delivered strong messaging to Albertans that this is a rapidly growing industrial sector. The implications of this rapidly expanding AI/DC sector will be immense and felt at a full range of spatial (small to large) and temporal (short-term to long-term) scales. As such, Albertans deserve to understand the full complement of benefits and liabilities.

Recommendations

The most appropriate forum for completion of a comprehensive and strategic-level cumulative effects assessment of AI/DCs is the Government of Alberta - specifically a public process under the auspices of the Alberta Land Use Framework. And since this strategic assessment has not been completed, its dynamic and uncertain consequences (both favourable and adverse) are being addressed ad-hoc at the project level (i.e., Indus AI/DC).

In the absence of a provincial level assessment, it is my recommendation that AUC require Beacon to adopt and compete a systems-based cumulative effects modelling framework to explore an inclusive range of "what-if" scenarios that robustly examine the interface between an emergent network of regional AI/DCs and key VCs (natural capital (air, land, water, biodiversity) and socio-economic components at appropriate spatial and temporal scales.

Glossary

AAAQO	Alberta Ambient Air Quality Objectives
ABMI	Alberta Biodiversity Monitoring Initiative
AESO	Alberta Electric System Operator
AI/DC(s)	Artificial Intelligence / Data Center(s)
BMP	Best management practices
BYOE	Bring your own electricity
AI	Artificial Intelligence
AI/DC	Artificial Intelligence / Data Centers
AUC	Alberta Utilities Commission
CE	Cumulative Effects
CEA	Cumulative Effects Assessment
CER	Cumulative Effects Review
CO	Carbon Monoxide
CO_2e	Carbon dioxide emission equivalency
DC	Data Center(s)
GHG	Greenhouse gases
GoA	Government of Alberta
HIA	Health Impact Assessments
IA	Impact Assessment
IARG	Indus and Area Residents Group
MD	Municipality
NO2	Nitrogen Dioxide
N0x	Nitrogen Oxide
PM 2.5	Particulate Matter 2.5
VC	Valued Component
VEC	Valued Ecosystem Component

Units

B	billion
gW	gigawatt
kW	kilowatt
km^2	1 square km
M	million
mW	megawatt
mWh	megawatt hour
μ g/m^3	micrograms per cubic meter
m^3	cubic meters

References

Aczel, M. Et al. 2026. UNU-INWEH Report: Aczel, M., Chamanara, S., Matin, M., Farsi, A., Marwala, T., Madani, K. (2026). *Environmental Cost of AI's Energy Use: Carbon, Water and Land Footprints*. United Nations University Institute for Water, Environment and Health (UNU-INWEH), Richmond Hill, Ontario, Canada. doi: 10.53328/INR26RMA002. https://unu.edu/inweh/collection/environmental-cost-of-AIs-Enrgy-Use-Carbon-water-and-land-footprints

Alberta Climate Futures. 2019. Alberta Climate Futures. https://open.alberta.ca/dataset/89a69583-a11b-4e31-a857-b311ab6563cc/resource/17ce2d24-ba7b-466c-acd9-33a2cf6beb69/download/aep-alberta-climate-report-arc.pdf

Alberta Electric System Operator. 2026. Connection Project List Dashboard, https://aeso-portal.powerappsportals.com/connection-project-dashboard/

Alberta Land Use Framework (amended 2025). South Saskatchewan Regional Plan. https://landuse.alberta.ca/RegionalPlans/SouthSaskatchewanRegion/Pages/default.aspx

Alberta Utilities Commission (AUC). 2026. AUC Bulletin 2025-12. (https://media.auc.ab.ca/prd-wp-uploads/News/2025/Bulletin%202025-12.pdf)

Alberta Utilities Commission. 2026. Beacon AI Centers – Indus Project Thermal Power Plant. https://www.auc.ab.ca/featured/beacon-ai-centers-indus-project-thermal-power-plant/

Baxter, Wanda, ,William A. Ross &Harry Spaling. 2012. improving the practice of cumulative effects assessment in Canada. Pages 253-262. Published online: 20 Feb 2012. https://doi.org/10.3152/147154601781766916

Beacon. 2026. Beacon AI Centers Indus Project thermal power plant. https://www.auc.ab.ca/featured/beacon-ai-centers-indus-project-thermal-power-plant/. Filing to Alberta Utilities Commission.

Canadian Climate Institute. 2026. Extreme Heat. Canadian Climate Institute (https://climateinstitute.ca/reports/extreme-heat-in-canada/).

Center for Biological Diversity 2025. https://biologicaldiversity.org/programs/climate_law_institute/pdfs/DataCrunch_report.pdf.

Chepesiuk, R. 2009. Missing the Dark: Health Effects of Light Pollution. Environ Health Perspect. 2009 Jan;117(1): A20–A27. doi: 10.1289/ehp.117-a20. https://pmc.ncbi.nlm.nih.gov/articles/PMC2627884/

City of Calgary. 2026. Guiding Calgary's growth. Area Structure Plans. https://www.calgary.ca/planning/area-structure-plans.html.

Council of Canadian Academies, 2019. Greater Than the Sum of Its Parts: Toward Integrated Natural Resource Management in Canada. Ottawa (ON): The Expert Panel on the State of Knowledge and Practice of Integrated Approaches to Natural Resource Management in Canada. https://cca-reports.ca/reports/the-state-of-knowledge-and-practice-of-integrated-approaches-to-natural-resource-management-in-canada/

Dark Sky. 2026. Data center light pollution: DarkSky s statement on responsible development. https://darksky.org/news/data-center-light-pollution-darkskys-statement-on-responsible-development/

Duinker, P.N. and Greig, L.A. (2007) Scenario Analysis in Environmental Impact Assessment: Improving Explorations of the Future. Environmental Impact Assessment Review, 27, 206-219. https://doi.org/10.1016/j.eiar.2006.11.001.

Fernandez-Quezada, D., Diana Emilia Martínez-Fernández [3], Ileana Fuentes [1,2], Joaquín García-Estrada [1,2], Sonia Luquin . 2026. The Influence of Noise Exposure on Cognitive Function in Children and Adolescents: A Meta-Analysis. NeuroSci. 2025 Mar 4;6(1):22. doi: 10.3390/neurosci6010022.

Gardiner, D. 2026. AI and Data Centres. Climate and nature risks for investors. 2026. Insights. IIGCC. https://www.iigcc.org/insights/ai-data-centres-climate-and-nature-risks-for-investors.

Gimeno-Ferrer et al. 2026. Airborne particulates and brain health: The role of $PM_{2.5}$ in blood–brain-barrier dysfunction. https://pmc.ncbi.nlm.nih.gov/articles/PMC12885965/#abstract1. J Cereb Blood Flow Metab. 2026 Feb 8:0271678X261418925. Online ahead of print. doi: 10.1177/0271678X261418925.

Government of Alberta. 2009. AENV water shortage procedures for the South Saskatchewan River basin. https://open.alberta.ca/publications/0778546195

Government of Alberta. 2026a. Artificial Intelligence Data Centres Strategy 2026. Government of Alberta. https://www.alberta.ca/artificial-intelligence-data-centres-strategy.

Government of Alberta. 2026b. Alberta s Artificial Intelligence (AI) Data Centres Strategy: Powering the Future of Artificial Intelligence. https://open.alberta.ca/publications/albertas-ai-data-centre-strategy.

Government of Alberta 2026. Alberta Land-Use Framework. 2026.Cumulative Effects. https://www.alberta.ca/land-resource-planning-overview.

Government of Alberta. 2026. Fine Particulate Matter. https://www.alberta.ca/air-indicators-fine-particulate-matter

Government of Canada. 2026. Beacon AI Centers Indus Project. https://iaac-aeic.gc.ca/050/evaluations/exploration?projDocs=90121&search=Indus+and+Area+Residents+Group

Han et al., 2026. The Unpaid Toll: Estimating and Addressing the Public Health Impact of Data Centers. Published in Computers and Society. https://arxiv.org/pdf/2412.06288

Hanwha Data Centers. 2026. What Are the Power Requirements for AI Data Centers. https://www.hanwhadatacenters.com/blog/what-are-the-power-requirements-for-ai-data-centers/

International Energy Agency. 2026. https://iea.blob.core.windows.net/assets/de9dea13-b07d-42c5-a398-d1b3ae17d866/EnergyandAI.pdf

Herring Storer Acoustics. 2025. https://www.epa.wa.gov.au/sites/default/files/Additional_Assessment_Information/Appendix%203%20-%20Noise%20Assessment.pdf

Impact Assessment Agency of Canada 2026. Beacon AI Centres Project. Impact Assessment Agency of Canada.

Indus and Area Residents Group. 2026. https://iaac-aeic.gc.ca/050/evaluations/exploration?projDocs=90121&search=Indus+and+Area+Residents+Group

Jenbacher. 2024. Technical Description Genset JGS 416 GS-N.L. https://leap.epa.ie/docs/dfad5cd6-0de5-43bd-9cfd-51e1efe4c84a.pdf

Joseph, C. et al. 2023. Thomas I. Gunton,James Hoffele &Martha Baldwin. Pages 162-174. Published online: https://www.tandfonline.com/doi/full/10.1080/14615517.2023.2170093?role=tab&tab=permissions&scroll=top&utm_source=openai#abstract.

Joseph, C., Gunton, T. I., Hoffele, J., & Baldwin, M. 2023. Improving cumulative effects assessment: alternative approaches based upon an expert survey and literature review. *Impact Assessment and Project Appraisal*, *41*(2), 162–174. https://doi.org/10.1080/14615517.2023.2170093.

Kane, J.W. 2025. AI, data centers, and water. A growing need for regional coordination amid economic development potential. November 20, 2025. Brookings., https://www.brookings.edu/

McKinley and Company, 2026. The $7 trillion data center build-out: How industrials can capture their share https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-7-trillion-dollar-data-center-build-out-how-industrials-can-capture-their-share

Mineo, L. The Harvard Gazette. 2026. Why are communities pushing back against data centers? https://news.harvard.edu/gazette/story/2026/04/why-are-communities-pushing-back-against-data-centers/

National Geographic 2026. Light Pollution. https://education.nationalgeographic.org/resource/light-pollution/

NEPA 1970. National Environmental Policy Act (NEPA) of 1970. Government of the United State of America.

Nutt, David. 2025. Cornell University. Roadmap shows the environmental impact of AI data center boom. https://news.cornell.edu/stories/2025/11/roadmap-shows-environmental-impact-ai-data-center-boom

Schneider, R. 2013. Alberta's natural subregions under a changing climate. https://www.eralberta.ca/wp-content/uploads/2017/05/Schneider_2013_Albertas_Natural_Subregions_under_a_Changing_Climate_ABMI.pdf)

Walker, C. And Ol. Goldsmith. 2026. Explainer. From Energy Use to Air Quality, the Many Ways Data Centers Affect US Communities. February 17, 2026. World Resources Institute. https://www.wri.org/insights/us-data-center-growth-impacts.

World Atlas of Night Sky Brightness. 2026. Light pollution map. lightpollutionmap.info/#zoom=6.54&lat=42.5537&lon=-76.6448&state=eyJiYXNlbWFwIjoiTGF5ZXJCaW5nUm9hZCIsIm92ZXJsYXkiOiJzYl8yMDI1Iiwib3ZlcmxheWNvbG9yIjpmYWxzZSwib3ZlcmxheW9wYWNpdHkiOiI2MCIsImZlYXR1cmVzb3BhY2l0eSI6Ijg1In0=

World Health Organization. 2011. Noise. https://www.who.int/europe/news-room/fact-sheets/item/noise

World Resources Institute. 2026. From Energy Use to Air Quality, the Many Ways Data Centers Affect US Communities. https://www.wri.org/insights/us-data-center-growth-impacts.

Zhang Y, Han Y, Guan K. 2025. The Impact of Noise Pollution on Cognitive Function in Middle-Aged and Older Adults: Empirical Evidence from the CHARLS. Behav Sci (Basel). 2025 Oct 16;15(10):1404. doi: 10.3390/bs15101404. PMID: 41153194; PMCID: PMC12561724. https://pmc.ncbi.nlm.nih.gov/articles/PMC12561724/

Žiaran, Stanislav & Šooš, Ľubomír & Čačková, Iveta & Chlebo, Ondrej. (2025). Low Frequency Sound Generated by Industrial Equipment and its Negative Impact on Human Health. Strojnícky časopis - Journal of Mechanical Engineering. 75. 131-142. 10.2478/scjme-2025-0030.

https://www.researchgate.net/publication/398293395_Low_Frequency_Sound_Generated_by_Industrial_Equipment_and_its_Negative_Impact_on_Human_Health/citation/download