

# CANNABIS ENVIRONMENTAL BEST MANAGEMENT PRACTICES GUIDE

## EXECUTIVE SUMMARY



**DENVER**  
ENVIRONMENTAL HEALTH

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# EXECUTIVE SUMMARY

Under the leadership of Mayor Michael B. Hancock, Denver has committed to reducing greenhouse gas (GHG) emissions 80 percent below 2005 levels by 2050.

Commercial buildings represent 35 percent of citywide emissions, and as cannabis businesses occupy an increasing amount of commercial building space, the industry plays an important role in helping the community meet its emissions targets.

National and international attention is increasingly being focused on the sustainability impacts of the cannabis industry in states where it has been legalized. While some cannabis businesses have initiated sustainability programs to reduce environmental impacts an overall lack of high-quality information, including academic research and unbiased case studies, is a barrier for businesses interested in making sustainability improvements. Additionally, because sector-wide baseline sustainability metrics are not currently available, overall industry sustainability performance remains unverified, leaving public perception open to individual interpretation.

In 2016, Denver Environmental Health collaborated with local cannabis industry representatives, sustainability practitioners and regional stakeholders to create the Cannabis Sustainability Work Group. The group's mission is to promote sustainability in the cannabis industry through education, the development and dissemination of best practices, and the facilitation of dialogue between the cannabis industry, the community and technical experts.

The Cannabis Environmental Best Management Practices Guide (the Guide) provides an overview of environmental best practices for energy, water and waste management in indoor cannabis cultivation facilities. While it focuses on the sustainability context and goals in the Denver metro area, many of the recommended practices are broadly applicable to similar

operations in other areas.

The Guide examines each segment through the lens of economic competitiveness, community relations and environmental impacts, also known as the triple-bottom-line of sustainability.

- **Economic Competitiveness** – Energy and water use and waste disposal represent a significant portion of a cultivation facility's total operating budget. Reducing consumption and improving efficiency is good for the bottom line.
- **Community Relations** – As the cannabis industry continues to grow, the electric demands of cultivation facilities can potentially lead to grid outages that affect the local community. Colorado is an arid state and conservation helps to ensure that adequate water is available for all users. Effective solid waste management can help reassure neighborhood residents that a cannabis cultivation operation is a responsible local environmental partner.
- **Environmental Impact** – Energy use in buildings is Denver's largest source of GHG emissions. Water use and waste generation also have associated energy and GHG impacts, including the electricity used to pump and treat water, and to methane emissions from landfills. Reducing energy and water consumption and diverting waste are key strategies toward reducing emissions and associated climate change impacts, which scientists project will include an increase in severe weather events, changes in the timing and availability of snow runoff, and degraded air and water quality in Denver.

# SUMMARY OF RECOMMENDED BEST PRACTICE STRATEGIES

## Improving Energy Efficiency

Indoor cannabis cultivation is a resource-intensive process, with energy demands as the highest contributor to the industry's large environmental footprint. While growing cannabis in a controlled indoor space leads to faster production and greater product variety, high energy costs and increasing price competition are pushing cultivators to closely manage the energy impacts. Decisions relating to cultivation facility design should be driven by location-specific metrics and cultivation processes. A common public perception of the cannabis industry as an excessive energy consumer contributes to negative attention. Cultivation facilities (like all buildings) contribute to the greater community-wide impacts of energy use including air quality and greenhouse gas emissions. Energy efficiency efforts can help cannabis businesses create positive improvements within communities.

## Reducing Water Demand and Improving Wastewater Quality

To address the industry water consumption, the best practices discussed in the Guide target irrigation methods, water recycling and recapture opportunities, and filtration and purification systems. Tips on the most effective layouts show how to physically integrate process systems for effective water recapture and reuse. To ensure the quality of water that is applied, practice responsible cultivation that can impact water quality and reusability, such as excessive pesticide use and overwatering.

## Waste Management

Cannabis cultivation and sales can generate a large amount of waste from plant material and pesticides to packaging and light bulbs. In Denver, landfilling is the main form of waste disposal with recycling and composting used to a lesser extent. Fortunately, there are many good options for minimizing the amount of waste that must go to a landfill or to a hazardous waste recovery facility. When sent to the landfill, waste decomposes anaerobically generating methane gas, the most potent of all greenhouse gasses. Hazardous waste should be avoided whenever possible. Reducing, reusing, recycling or composting waste and utilizing alternative methods to manage waste is critical.

Responsible purchasing decisions, coupled with employee education on waste diversion practices, can increase recycling rates and decrease reduce hazardous waste generation. Cannabis waste is strictly regulated. Therefore, the Guide presents best practices to minimize the industry's environmental impacts from waste while working within the boundaries of Colorado laws.

During development of the Guide, work group members identified environmental, social and economic sustainability aspects for indoor cultivation operations in the Denver metro area. Each topic addressed in the guide has associated significant aspects noted. The significant aspects are:

- Energy consumption
- GHG emissions
- Water consumption
- Effluent discharge (water quality)
- Solid waste generation
- Materials use
- Land use
- Odor control
- Regulatory compliance
- Indoor air quality

Throughout the Guide, each of these aspects is considered for impact per segment and sustainability area. The impacts associated with these aspects are:

- Climate
- Ecosystems
- Water quality
- Community relations
- Employee well-being
- Regional stakeholder alignment
- Operational and compliance budgets

TOPICS	ENERGY - EXAMPLE BEST PRACTICES
Measurement & Verification	<ul style="list-style-type: none"> <li>Track metrics, such as:                             <ul style="list-style-type: none"> <li>Grams of dry flower produced per kilowatt hour of energy consumed</li> <li>Return on investment of energy saving equipment</li> </ul> </li> </ul>
Scheduling	<ul style="list-style-type: none"> <li>Manage time of use</li> <li>Stagger energy-intensive processes with lighting cycle to minimize peak power demands</li> </ul>
Lighting	<ul style="list-style-type: none"> <li>Measure light quality regularly</li> <li>Replace lamps on performance-based schedule rather than a fixed interval schedule</li> </ul>
HVAC & Dehumidification	<ul style="list-style-type: none"> <li>Seal spaces as much as possible to improve equipment efficiency, reduce CO2 exhaust, improve biosecurity and reduce odors emanating from the facility</li> </ul>
On-site Power Generation	<ul style="list-style-type: none"> <li>Consider combined heat and power systems, which can reduce emissions by 25 to 45 percent and serve as reliable source of power during grid outages</li> </ul>
Off-site Energy Supply	<ul style="list-style-type: none"> <li>Local community solar programs allow businesses to utilize renewable energy (and associated potential cost savings) without installing panels onsite</li> </ul>

TOPICS	WATER - EXAMPLE BEST PRACTICES
Water Filtration & Purification	<ul style="list-style-type: none"> <li>Use carbon filtration rather than reverse osmosis for solid waste minimization, water use optimization and energy efficiency</li> </ul>
Irrigation Methods & Automation	<ul style="list-style-type: none"> <li>Utilize an automated watering system to help control accuracy and efficiency, increase data collection and reduce human error</li> </ul>
Water Recycling	<ul style="list-style-type: none"> <li>Incorporate water recapture and reuse into existing cultivation processes</li> <li>Use recaptured water for the subsequent watering cycle (after purification)</li> </ul>
Improving Wastewater Quality	<ul style="list-style-type: none"> <li>Avoid the use of reverse osmosis, which generates significant volumes of brine which must be discarded to sanitary drains</li> </ul>

TOPICS	WASTE - EXAMPLE BEST PRACTICES
Organic Waste Management	<ul style="list-style-type: none"> <li>Recycle organic waste through Bokashi fermentation or composting</li> </ul>
Universal & Hazardous Waste	<ul style="list-style-type: none"> <li>Purchase materials such as pesticides in smaller quantities</li> <li>Prepare only the amount needed for each application to reduce potential waste</li> </ul>
Packaging	<ul style="list-style-type: none"> <li>Select packaging that is made from recycled content and is recyclable and/or compostable</li> </ul>
Recycling	<ul style="list-style-type: none"> <li>Co-locate recycling containers with garbage receptacles and include appropriate signage</li> </ul>