

with critical material needs, including Federal programs involving research and development, in a manner that complements related efforts carried out by the private sector and other domestic and international agencies and organizations;

(D) examine options for accessing and developing critical materials through investment and trade with our allies and partners and provide recommendations;

(E) evaluate and provide recommendations to incentivize the development and use of advances in science and technology in the private industry;

(F) assess the need for and make recommendations to address the challenges the United States critical materials supply chain workforce faces, including aging and retiring personnel and faculty, and foreign competition for United States talent;

(G) develop, and update as necessary, a strategic plan to guide Federal programs and activities to enhance scientific and technical capabilities across critical material supply chains, including a roadmap that identifies key research and development needs and coordinates on-going activities for source diversification, more efficient use, recycling, and substitution for critical materials; as well as cross-cutting mining science, data science techniques, materials science, manufacturing science and engineering, computational modeling, and environmental health and safety research and development;

(H) assess the need for, and make recommendations concerning, the availability and adequacy of the supply of technically trained personnel necessary for critical materials research, development, extraction, and industrial production, with a particular focus on the problem of attracting and maintaining high-quality professionals for maintaining an adequate supply of energy critical materials; and

(I) report to the appropriate Congressional committees on activities and findings under this section.

**(c) Definitions of critical mineral and critical mineral or metal**

In this section, the terms “critical mineral” and “critical mineral or metal” include any host mineral of a critical mineral (within the meaning of those terms in section 1606 of title 30).

(Pub. L. 117–167, div. B, title III, §10359, Aug. 9, 2022, 136 Stat. 1564.)

**§ 19068. Advancing IoT for Precision Agriculture Capabilities Act**

**(a) Short title**

This section may be cited as the “Advancing IoT for Precision Agriculture Act of 2021”.

**(b) Purpose**

It is the purpose of this section to promote scientific research and development opportunities for connected technologies that advance precision agriculture capabilities.

**(c) Foundation directive on agricultural sensor research**

In making awards under the sensor systems and networked systems programs of the Foundation, the Director shall include in consideration of portfolio balance research and development on sensor connectivity in environments of intermittent connectivity and intermittent computation—

(1) to improve the reliable use of advance sensing systems in rural and agricultural areas; and

(2) that considers—

(A) direct gateway access for locally stored data;

(B) attenuation of signal transmission;

(C) loss of signal transmission; and

(D) at-scale performance for wireless power.

**(d) Omitted**

**(e) GAO review**

Not later than 18 months after August 9, 2022, the Comptroller General of the United States shall provide—

(1) a technology assessment of precision agriculture technologies, such as the existing use of—

(A) sensors, scanners, radio-frequency identification, and related technologies that can monitor soil properties, irrigation conditions, and plant physiology;

(B) sensors, scanners, radio-frequency identification, and related technologies that can monitor livestock activity and health;

(C) network connectivity and wireless communications that can securely support digital agriculture technologies in rural and remote areas;

(D) aerial imagery generated by satellites or unmanned aerial vehicles;

(E) ground-based robotics;

(F) control systems design and connectivity, such as smart irrigation control systems;

(G) Global Positioning System-based applications; and

(H) data management software and advanced analytics that can assist decision making and improve agricultural outcomes; and

(2) a review of Federal programs that provide support for precision agriculture research, development, adoption, education, or training, in existence on August 9, 2022.

(Pub. L. 117–167, div. B, title III, §10361, Aug. 9, 2022, 136 Stat. 1567.)

**Editorial Notes**

**CODIFICATION**

Section is comprised of section 10361 of Pub. L. 117–167. Subsec. (d) of section 10361 of Pub. L. 117–167 amended section 1862i of this title.

**§ 19069. Astronomy and satellite constellations**

The Director shall support research into and the design, development, and testing of mitigation measures to address the potential impact of