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Greetings Delegates,

Welcome to SRMUN Atlanta 2019 and the International Atomic Energy Agency (IAEA). My name is J.B. Desselle, and I am serving as your Director for the IAEA. This is my seventh conference as a SRMUN staff member. Previously, I served as the Director of the General Assembly at SRMUN Atlanta 2018 and as the Secretary-General of Atlanta 2017. I graduated with a Bachelor's degree in Intercultural Communications in 2014 from Valdosta State University and I received my Master's degree in International Conflict Resolution. Our committee's Assistant Directors are Michael Bovi and Yanelle Cruz. Even though this is Michael's first time on staff, he is not new to the SRMUN scene as he has previously attended SRMUN as a delegate for the last three years. Michael is a graduate of the University of North Carolina at Charlotte where he majored in Computer Science. Yanelle is excited to make her return to SRMUN Atlanta after previously serving as the Director for the Economic and Social Commission for Asia and the Pacific (ESCAP) at SRMUN Atlanta 2017, and the Assistant Director for the United Nations Human Settlements Programme (UN-Habitat) at SRMUN Charlotte 2017. Yanelle is a graduate from Tufts University where she studied Sociology and Political Science.

The IAEA's mission is to promote the use of nuclear science and technology for various peaceful purposes. The IAEA works toward achieving its goals by establishing safety protocols for nuclear energy use and facilitating the transfer of technologies and knowledge.

By focusing on the mission of the IAEA, we have developed the following topics for the delegates to discuss and work together on developing meaningful and sustaining solutions:

I. Strengthening the Security of Radiological Material Facilities
II. The Role of Nuclear Energy in Sustainable Urbanization

The background guide provides a strong introduction to the committee and its topics and should be utilized as a foundation for the delegate's independent research. While we have attempted to provide a holistic analysis of the issues, the background guide should not be used as the single mode of research for the topics. Delegates are expected to go beyond the background guide and engage in an intellectual inquiry of their own. The position papers for the committee should reflect the complexity of these issues and their externalities. Delegations are expected to submit a position paper and be prepared for a vigorous discussion at the conference. Position papers should be no longer than two pages in length (single spaced) and must demonstrate your Member State's position, policies, and recommendations on each of the two topics. Delegates should visit srmun.org for more detailed information about guidelines, formatting, and the position papers. ***All position papers MUST be submitted no later than Friday, November 1, 2019, by 11:59pm EST via the SRMUN website.***

Michael, Yanelle, and I are enthusiastic about serving as your dais for the IAEA. We wish you all the best of luck in your conference preparation and look forward to working with you in the near future. Please feel free to contact Director-General Sydnee Abel, Michael, Yanelle, or myself if you have any questions while preparing for the conference.

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Committee History of the International Atomic Energy Agency (IAEA)

The International Atomic Energy Agency (IAEA) was established in 1957 as a response to the deep fears and expectations stimulated by the findings and diverse applications of nuclear technology. The IAEA was unanimously approved in 1956 by 81 Member States.[1] The agency's genesis was a result of United States of America's (US) President Dwight Eisenhower's "Atoms for Peace" speech to the United Nations General Assembly (UNGA) on December 8, 1953.[2] President Eisenhower's address outlined a future in which there would be useful and peaceful applications for atomic and nuclear technology. Thus, the U.S. Ratification of the Statute by Eisenhower on July 29, 1957, marked the inception of the IAEA.[3] Apart from being an ideological cornerstone of the IAEA, the address generated positive change in the international community's stance on the peacetime uses of fissionable matter, and would later serve the same purpose in the establishment of a number of projects, partnerships, and initiatives.[4]

The IAEA's principal document of governance, the Statute of the IAEA, was approved in 1956 and came into full effect in 1957.[5] The statute constitutes the IAEA mandate which is, "to promote and control the Atom," as specified in Article II.[6] The IAEA's primary objectives include to encourage the peaceful development of atomic energy for non-military purposes, safeguard and monitor its uses, and exercise objectives which echo the IAEA's mission.[7] Following these pillars, the IAEA works with Member States, international organizations (IOs), and other partnering bodies to administrate safeguards, develop nuclear technologies, and ensure peaceful applications for all. As an autonomous IO within the United Nations (UN), the IAEA partners, and collaborates with more than a dozen UN agencies including the Food and Agriculture Organization (FAO), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), and the World Health Organization (WHO).[8] The IAEA also partners with other IOs, such as the International Renewable Energy Association (IRENA), the National Oceanic and Atmospheric Administration (NOAA), and a number of intergovernmental organizations (IGOs) across the globe, thereby extending the reach and influence of the IAEA mandate.[9]

Through its partnerships and projects, the IAEA seeks to promote an accelerated focus on atomic energy contributions for the purposes of peace, health, and prosperity throughout the world, further enabling its contribution to the advancement of nine out of 17 UN Sustainable Development Goals (SDGs).[10] Aligned with these goals, the IAEA is currently undergoing approximately 18 different projects regarding nuclear and radiation safety, waste management, industry, infrastructure, food and agriculture, water, energy, and health.[11] Due to international concern over the application of nuclear energies for military use, an important provision of the IAEA's mandate stands to dissuade, prevent, and control the use of nuclear technology to further any military application.[12] As a result, the IAEA is designated as the international verifier of safeguards to ensure no subversion in the peaceful applications of atomic energy, as outlined in Article III. Assuming this role, one of the IAEA's most notable responsibilities is to ensure Member State compliance with the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), amongst other such treaties.[13] Despite public concern, since 2009 through July 2019, then-IAEA Director-General Yukiya Amano proposed a variety of peaceful alternatives, for the use of nuclear science in the developing world, including in generating electricity, fighting cancer, increasing food production, managing water resources, and monitoring

[1] "History," IAEA, June 8, 2016, https://www.iaea.org/about/overview/history.
[2] "History," IAEA.
[3] "History," IAEA.
[4] Eisenhower, Dwight, "Atoms for Peace Speech," IAEA, July 16, 2014, https://www.iaea.org/about/history/atoms-for-peace-speech.
[5] "History," IAEA, June 8, 2016, https://www.iaea.org/about/overview/history.
[6] "History," IAEA.
[7] The International Atomic Energy Agency, *The Statute of the IAEA,* February 23, 1989, Article 3.
[8] "United Nations System," IAEA, June 8, 2016, https://www.iaea.org/about/partnerships/united-nations-system.
[9] "Other Organizations," IAEA, June 8, 2016, https://www.iaea.org/about/partnerships/other-organizations.
[10] "Sustainable Development Goals (SDGs)," IAEA, June 8, 2016, https://www.iaea.org/about/overview/sustainable-development-goals.
[11] "Partnerships," IAEA, June 8, 2016, https://www.iaea.org/about/partnerships.
[12] "Key Roles," IAEA, July 11, 2014, https://www.iaea.org/newscenter/focus/npt/key-roles.
[13] "Key Roles," IAEA.

climate change.[14] In late July 2019, Yukiya suddenly passed away, and his IAEA duties has been assigned to Acting Director-General Cornel Feruta.[15,16]

The IAEA established its official headquarters in Vienna, Austria, in 1957, with liaison offices later opening in New York City, US, and Geneva, Switzerland.[17] Additionally, several laboratories and regional safeguard offices have since been established in Seibersdorf, Austria; the Municipality of Monaco, Monaco; Trieste, Italy; Toronto, Canada; and Tokyo, Japan.[18] All of these bodies work jointly to carry out the mission of the IAEA.

The structure of the IAEA constitutes two policy-making bodies: the General Conference of IAEA Member States and the Board of Directors. The General Conference provides a forum where all 171 IAEA Member States may express concerns, suggestions, and settle the budget for the committee.[19] In making decisions, the General Conference requires a two-thirds majority vote, except in the case of additional questions or categories of questions decided by a two-thirds majority, in which case a majority vote would then be required.[20] The IAEA Board of Directors, which consists of 35 Board Members and one appointed Governor, is primarily tasked with making recommendations to the General Conference on IAEA financial statements, programs, and budgets.[21] Similar to the General Conference, decisions of the Board of Directors require a two-thirds majority, except in the case of the determination of additional questions or categories of questions, which would then require a majority vote.[22]

Programmes of the IAEA are supported by any of three separate funds: the Regular Budget Fund, the Technical-Cooperation Fund (TCF), and the IAEA's Extrabudgetary Funds.[23] The IAEA's regular programme is funded by its Regular Budget Fund, which is divided into two portions: operational and capital.[24] As of 2019, the IAEA General Conference has approximated USD 25 million towards the operational portion budget, which is used to finance operational costs, and approximately USD 7 million for the capital portion, which finances major infrastructure investments in order to carry out the committee's major capital investment plan.[25] The TCF is allocated towards the committees Technical Cooperation (TC) Programme, while the Extraordinary Funds is used for both the regular and TC programmes.[26] Contribution to both these funds are voluntary, in contrast to the Regular Budget Fund. Member States and donors are the primary contributors to these funds.[27]

Recently, 153 Member States and approximately 2,600 participants gathered for the IAEA's 62nd General Conference, where resolutions were adopted to further address groundbreaking nuclear science and technology developments, technical cooperation initiatives, and security and safeguards plans.[28] Certainly, the IAEA has continued to expand its scope with time. What once started as a speech which yearned for the peaceful applications of fissionable matter, now stands today as the primary enabler for countless projects, partnerships, and resolutions, which go above and beyond, "to promote and control the Atom."[29]

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[14] "Director General's Statement," IAEA, November 28, 2018, https://www.iaea.org/newscenter/statements/director-generals-statement-at-ministerial-conference-on-nuclear-science-and-technology-addressing-current-and-emerging-development-challenges.

[15] "Designation of an Acting Director General ," IAEA, July 25, 2019, https://www.iaea.org/newscenter/pressreleases/designation-of-an-acting-director-general

[16] "IAEA chief Yukiya Amano dies at 72," BBC World News, July 22, 2019, https://www.bbc.com/news/world-49069832

[17] "History," IAEA, June 8, 2016, https://www.iaea.org/about/overview/history.

[18] "History," IAEA.

[19] "List of Member States," IAEA, June 8, 2016, https://www.iaea.org/about/governance/list-of-member-states.

[20] "Rules and Procedures of the Board of Governors," IAEA, August 21, 2014, https://www.iaea.org/about/policy/board/rules-and-procedures-of-the-board-of-governors#item7.

[21] "Board of Governors," IAEA, June 8, 2016, https://www.iaea.org/about/governance/board-of-governors.

[22] "Rules of Procedure of the General Conference," IAEA, October 16, 2014, https://www.iaea.org/about/policy/gc/rules-of-procedure-general-conference#item11.

[23] "Budget," IAEA, June 8, 2016, https://www.iaea.org/about/overview/budget.

[24] "Budget." IAEA.

[25] "Regular Budget Appropriations for 2019," Atoms for Peace and Development, IAEA, September 20, 2018, https://www-legacy.iaea.org/About/Policy/GC/GC62/GC62Resolutions/English/gc62res-2_en.pdf.

[26] "Budget," IAEA, June 8, 2016, https://www.iaea.org/about/overview/budget.

[27] "Budget," IAEA.

[28] Marais, Estelle, "Resolutions Adopted as 62nd IAEA General Conference Concludes," September 21, 2018, https://www.iaea.org/newscenter/news/resolutions-adopted-as-62nd-iaea-general-conference-concludes.

[29] "History," IAEA, June 8, 2016, https://www.iaea.org/about/overview/history.

I. Strengthening the Security of Radiological Material Facilities

Introduction

Nuclear technology as an alternative energy source has helped many industries greatly advance since its discovery in the mid-20th century. Nuclear power generation has been effective and utilized in the energy, medical, and agricultural fields, along with academic, scientific, and even law enforcement sectors.[30] Radiological materials are commonly used in small-scale health procedures such as the dental x-ray, but when used on a larger-scale, it can still cause major negative environmental and health impacts.[31] Currently, there are thousands of facilities in over 100 Member States that use radiological material.[32] These facilities range from privately-secured energy facilities to academic and medical institutions. Locations such as medical facilities, have daily exposure to hundreds of people and each have a varying degree of facility security, there is a greater threat for these materials to be stolen and used in a nefarious manner. Protecting radiological devices during their entire lifespan has become a paramount issue for the International Atomic Energy Agency (IAEA) to prevent an act of terrorism.

The threat of radiological materials used as a means of weaponry, or more specifically, radiological dispersal devices (RDD), also known as a "dirty bomb," has been a growing concern to the international community.[33] Without radiological material properly secured, any level of radiological material exposure during a prolonged amount of time can cause major health impacts.[34] Radiological weapons can have the capability to emit radiation slowly and unknowingly into the public and can cause significant health issues, ecological issues, and even fatalities.[35] Due to their ability to create public hysteria, dirty bombs have been called "weapons of mass disruption" instead of "weapons of mass destruction." [36]

Public Threat from Radiological Material

The IAEA considers radiological material as "material designated in national law or by a regulatory body as being subject to regulatory control because of its radioactivity."[37] With more facilities using or storing radiological material, the protection and security of these establishments have become instrumental in preventing material theft threats. Facilities, such as medical clinics or hospitals, with daily visitors are more vulnerable to radiological material being stolen. In the United States of America (US), there were 272 reported incidents of theft in 2009.[38] That incident number rose to 2,926 incidents in 2015.[39] Materials taken from these facilities can cause major incidents from actors acting with malicious intent, or even those who accidentally cause exposure. In Goiania, Brazil, in 1987, two metal scrappers broke into an abandoned radiotherapy clinic and inadvertently took an x-ray machine's small radioactive capsule containing a common radioactive element: caesium-137.[40] Before they could sell the metal, one of the men opened the capsule and discovered the caesium powder glowing blue and showed the

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30 "Uses of Radiation," United States Nuclear Regulatory Commission, October 2, 2017, https://www.nrc.gov/about-nrc/radiation/around-us/uses-radiation.html.

31 "Backgrounder on Dirty Bombs," United States Nuclear Regulatory Commission, May 2018. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-dirty-bombs.html.

32 "Raising Awareness, Improving Security and Strengthening Global Standards to Prevent Dirty Bombs," Nuclear Threat Initiative, https://www.nti.org/about/radiological/ (accessed April 15, 2019).

33 Kuna P, Hon Z, Patodka J, "How Serious is the Threat of Radiological Terrorism," *Acta Medica* 52 no. 3 (2009): 85. https://www.ncbi.nlm.nih.gov/pubmed/20073419

34 Kuna P, "How serious is threat of radiological terrorism?," 85

35 "Nuclear & Radiological Terrorism: Defining the Threats" Federation of American Scientists, https://fas.org/issues/nuclear-and-radiological-terrorism/

36 "Backgrounder on Dirty Bombs," United States Nuclear Regulatory Commission, May 2018. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-dirty-bombs.html

37 The International Atomic Energy Agency, *IAEA Safety Glossary: Terminology Used in Nuclear, Radiation, Radioactive Waste and Transport Safety,* (Vienna: IAEA, September 2006), http://www-ns.iaea.org/downloads/standards/glossary/glossary-english-version2point0-sept-06-12.pdf

38 "5 Current Threats to Hospital Security," Lowers and Associate: International Risk Mitigation Partners. https://blog.lowersrisk.com/threats-hospital-security/ (accessed August 23, 2019).

39 "5 Current Threats to Hospital Security," Lowers and Associate: International Risk Mitigation Partners.

40 The International Atomic Energy Agency, *The Radiological Accident in Goidania,* (Vienna: IAEA, 1988),https://www-pub.iaea.org/MTCD/publications/PDF/Pub815_web.pdf

substance to his friends and family.[41] Within days, both men showed signs of acute radiation.[42] As more people were showing signs of radiation sickness, it had been two weeks already before local hospitals and authorities were able to diagnose the source of the issue, and precautions were put into place to remove the radiological material.[43] In that time, 249 people became contaminated, including 151 individuals having both external and internal injuries and 20 were in serious condition.[44] The incident resulted in five fatalities.[45] This national incident provided the framework of what a radiological contamination pattern could look if the exposure is not quickly diagnosed. While the men who found the caesium-137 had no intention of maliciously releasing the radioactivity, the lack of proper security or disposal of material allowed it to become exposed to the public.

Due to the threat of RDDs, radiological terrorism has become a greater risk in recent decades.[46] Radiological terrorism is the deliberate use of radiological materials as weapons that will emit radiation into the open.[47] These "weapons of mass disruption," depending on its chemistry, form, and location, can cause billions of dollars in damages due to the cost of evacuation, relocation, and cleanup of the material.[48] The inevitable follow-up impacts could have severe economic and psychological repercussions in areas of high populations.[49] Due to terrorist attacks from groups such as Al Qaeda, Boko Haram, ISIL, and others, much of the global community, including the US, has maintained a position that terrorist organizations have an interest in acquiring and would not hesitate in using radiological material.[50] The first attempt at a radiological terror attack was in 1995, when Chechen rebels threatened to activate a bomb and planted caches of caesium at a Moscow park in Russia.[51] Authorities found the material in the Ismailovsky Park but were unable to diagnose the source of where the material came from and the perpetrators.[52]

Current Situation

It is a massive undertaking to track where all radiological substances are stored, shipped, and utilized for the international community. With no international database with locations of all radiological material, Member States had to rely on each other's promise that their respective resources were securely stored. In 1995, the IAEA established the Incident and Trafficking Database (ITDB) to help improve security by collecting data on radioactivity incidents.[53] The ITDB gathers data from participating Member States who report any incidents involving illicit trafficking and any other unauthorized use of nuclear or radiological materials.[54] While reporting to the ITDB is voluntary, as of 2018, 138 Member States annually report to the ITDB. The ITDB breaks down all incidents into three groups: Group 1 is for when the incident is likely to have been done with malicious intent; Group 2 is for when incidents are from an undetermined intent; Group 3 is in which incidents are not likely to have

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[41] *The Radiological Accident in Goidania,* (Vienna: IAEA, 1988)
[42] *The Radiological Accident in Goidania,* (Vienna: IAEA, 1988)
[43] *The Radiological Accident in Goidania,* (Vienna: IAEA, 1988)
[44] *The Radiological Accident in Goidania,* (Vienna: IAEA, 1988)
[45] *The Radiological Accident in Goidania,* (Vienna: IAEA, 1988)
[46] "Nuclear & Radiological Terrorism: Defining the Threats" Federation of American Scientists, https://fas.org/issues/nuclear-and-radiological-terrorism/
[47] Kuna P, Hon Z, Patodka J, "How Serious is the Threat of Radiological Terrorism," *Acta Medica* 52 no. 3 (2009): 85. https://www.ncbi.nlm.nih.gov/pubmed/20073419
[48] "Backgrounder on Dirty Bombs," United States Nuclear Regulatory Commission, May 2018. https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-dirty-bombs.html
[49] Bieniawski, A; Illiopulos, I; Nalabandian, M; "Radiological Security Progress Report: Preventing Dirty Bombs – Fighting Weapons of Mass Disruption," *The Nuclear Threat Initiative*, 2016. https://media.nti.org/documents/NTI_Rad_Security_Report_final_0916.pdf
[50] James Clapper,"Statement for the Record on the Worldwide Threat Assessment of the U.S. Intelligence Community for the Senate Committee on Armed Services," Office of the Director of National Intelligence (March 10, 2011): p. 4. www.au.af.mil/au/awc/awcgate/dni/threat_assessment_10feb11.pdf
[51] Lexi Krock, Rebecca Deusser, "Dirty Bomb: Chronology of Events" Public Broadcasting Station. https://www.pbs.org/wgbh/nova/dirtybomb/chrono.html
[52] Lexi Krock, Rebecca Deusser, "Dirty Bomb"
[53] The International Atomic Energy Agency, *IAEA Incident and Trafficking Database: Incidents of nuclear and other radioactive material out of regulatory control 2019 Fact Sheet,* (Vienna: IAEA, 2019) https://www.iaea.org/sites/default/files/19/04/itdb-factsheet-2019.pdf
[54] *IAEA Incident and Trafficking Database,* (Vienna: IAEA, 2019)

been malicious.[55] Since the ITDB started its data collection in 1993, a total of 3,497 confirmed incidents were reported by December 31, 2018.[56] During 2018, 49 Member States disclosed 253 incidents had taken place.[57] Of the 3,497 incidents reported, 285 cases were categorized as Group 1, while 965 cases were determined to belong in Group 2, and the remaining 2,247 incidents as Group 3.[58] Although the number of incidents have stabilized in all three categories, the security of facilities that store, transport, and dispose of radiological substances are still of extreme importance, particularly over the last five years with concerns with the annual total of reported cases.[59]

Facilities with radioactive sources have varied security measures and this makes it incredibly difficult to achieve universal consistency in radiological material storage.[60] Establishments with radiological substances are subjective to comply with safety storage standards as prescribed by the IAEA.[61] These facilities can determine their own standards for their building security, although there have been consistent staff guidelines to receive proper authorization and specialized training on how to access and maintain these sources.[62] The IAEA only has legislative responsibility with material that produces ionizing radiation but does not have authority over non-ionizing radiation-producing materials. Ionizing radiation is any type of radiation that is able to penetrate biological material and cause harm.[63] When a radionuclide, a radioactive particle, is created, it is placed in a source holder to help shield and contain the radiation from the particle.[64] Once the holder has a radionuclide inside, the holder is referred to as a radiation source.[65] Radiation sources are then usually placed in a device, such as an x-ray machine, in which the radiation source can be moved around to control the radiation beam.[66]

Radioactive material is generally transported via the highway or by rail; however, it can be shipped through waterways.[67] Radiological material is only allowed to travel through air if it contains very low levels of radiation.[68] The transportation of radioactive substances have also presented obstacles in maintaining security. During the shipment of radiological materials, the vulnerability to risk increases because of potential exposure to staff, major ecological impacts if lost while in transit, and prone to theft.[69] The IAEA published its latest edition of the Regulations for the Safe Transport of Radioactive Material in 2018.[70] Since the standards were first released in 1961, the IAEA estimates that over one billion consignments of radioactive material have occurred, with a current average of 20 million shipments being completed each year.[71]

Based on potential hazards, characteristics of various radioactive substances, and method of delivery, the IAEA developed different packaging categories. The five different primary package categories are Type A, Type B, Type C, Excepted, and Industrial.[72,73] Type A packages contain "relatively small, but significant, quantities of radioactive

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55 *IAEA Incident and Trafficking Database,* (Vienna: IAEA, 2019)
56 *IAEA Incident and Trafficking Database,* (Vienna: IAEA, 2019)
57 *IAEA Incident and Trafficking Database,* (Vienna: IAEA, 2019)
58 *IAEA Incident and Trafficking Database,* (Vienna: IAEA, 2019)
59 *IAEA Incident and Trafficking Database,* (Vienna: IAEA, 2019)
60 The International Atomic Energy, *Sealed: Radioactive Sources,* (Vienna: IAEA, September 2013), https://www.iaea.org/sites/default/files/sealedradsource1013.pdf
61 *IAEA Safety Glossary,* (Vienna: IAEA, September 2006)
62 *Sealed: Radioactive Sources,* (Vienna: IAEA, September 2013)
63 *IAEA Safety Glossary,* (Vienna: IAEA, September 2006).
64 *Sealed: Radioactive Sources,* (Vienna: IAEA, September 2013)
65 *Sealed: Radioactive Sources,* (Vienna: IAEA, September 2013)
66 *Sealed: Radioactive Sources,* (Vienna: IAEA, September 2013)
67 *Section Two Packaging, Transportation, and Storage of Radioactive Materials,* (Washington D.C: 2014)
68 *Section Two Packaging, Transportation, and Storage of Radioactive Materials,* (Washington D.C: 2014)
69 "Transport of Radioactive Materials" World Nuclear Association, July 2017, http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/transport-of-nuclear-materials/transport-of-radioactive-materials.aspx
70 The International Atomic Energy Agency, *Regulations for the Safe Transport of Radioactive Material,* (Vienna: IAEA, 2018), http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/transport-of-nuclear-materials/transport-of-radioactive-materials.aspx
71 *Regulations for the Safe Transport of Radioactive Material,* (Vienna: IAEA, 2018)
72 The United States Department of Energy, *Section Two Packaging, Transportation, and Storage of Radioactive Materials,* (Washington D.C: 2014), https://www.energy.gov/sites/prod/files/2014/04/f14/rmem2_0.pdf
73 "Package Types used for Transporting Radioactive Materials," World Nuclear Transport Institute. March 2013 https://www.wnti.co.uk/media/38413/FS2_EN_MAR13_V2.pdf

material" during transport and it typically includes medical or industrial radioisotopes but also some nuclear fuel materials.[74] The Type A packages have to go through a series of tests to ensure it can prevent radiological material from escaping; these shipments typically include most radionuclides and radioactive sources.[75] In the US, the Department of Energy noted it conducts a series of necessary tests for the Type A label, ranging from how packages react to water and weight compression.[76] Type B is for any material that exceeds the requirements for a Type A package, usually for nuclear fuel rods or waste, and undertake the same and additional tests for its label.[77] The Expected category has minimal levels of potential hazards and no tests are required, while the Industrial label also contain low-activity substances such as uranium oxide from mines.[78]

Once a radioactive source has lost its useful level of energy and its intended purpose, it becomes radioactive waste and it's sent to a storage facility to oversee the material's half-life completion.[79] Generally, most radioactive waste facilities have to abide by standards of disposal set by each Member State's local government. Waste facilities have to receive approval before disposing the radiological material. While some Member States have high waste standards, there is a lack of enforcement for international waste management safety standards.[80] This again raises the issue of consistency across the international community for ensuring waning radioactive sources are secured properly.[81]

Actions Taken by the IAEA

The IAEA has actively worked towards the safety and security improvements of radioactive materials for the last two decades. The IAEA began discussing basic safety standards with radiological material after the agency discovered many sources of radioactive material were not properly overseen.[82] This issue was brought to international attention during the IAEA's International Conference on the Safety of Radiation Sources and Security of Radioactive Materials in Dijon, France, in 1998.[83] During the conference, there was the design for an Action Plan titled "Safety of Radiation Sources and the Security of Radioactive Material," which called for action on international standards on the safety of radiation material, upgrading regulatory infrastructure, storage and disposal of disuse sources, and the creation of categorization of sources.[84] Another major component of the Action Plan was the creation of the Code of Conduct on the Safety and Security of Radioactive Sources (CoC), designed in 1999.[85] The CoC was established to help achieve a high level of safety and security of radioactive material and sources that could pose a significant risk to the general public.[86]

After the terrorist attacks on September 11, 2001, in the US, the international community became increasingly concerned about the security of radiological material.[87] The CoC was updated and strengthened to address more technical and legal issues, and, in 2003, a revised CoC was published by the IAEA.[88] The CoC update resulted in the creation of the Categorization of Radiological Sources.[89] Radiological materials were categorized into five category levels.[90] Category 1 material is substances that have an activity to radionuclide ratio of greater than 1,000 and can

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[74] "Package Types used for Transporting Radioactive Materials," World Nuclear Transport Institute. March 2013
[75] *Section Two Packaging, Transportation, and Storage of Radioactive Materials,* (Washington D.C: 2014)
[76] *Section Two Packaging, Transportation, and Storage of Radioactive Materials,* (Washington D.C: 2014),
[77] *Section Two Packaging, Transportation, and Storage of Radioactive Materials,* (Washington D.C: 2014)
[78] *"Transport of Radioactive Materials," World Nuclear Association.*
[79] *Section Two Packaging, Transportation, and Storage of Radioactive Materials,* (Washington D.C: 2014)
[80] *Section Two Packaging, Transportation, and Storage of Radioactive Materials,* (Washington D.C: 2014)
[81] *Section Two Packaging, Transportation, and Storage of Radioactive Materials,* (Washington D.C: 2014)
[82] The International Atomic Energy Agency, *Safety of Radiation Sources and Security of Radioactive Materials,* (Vienna: IAEA, June 1999), https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1042_web.pdf
[83] *Safety of Radiation Sources and Security of Radioactive Materials,* (Vienna: IAEA, June 1999)
[84] *Safety of Radiation Sources and Security of Radioactive Materials,* (Vienna: IAEA, June 1999)
[85] *Safety of Radiation Sources and Security of Radioactive Materials,* (Vienna: IAEA, June 1999)
[86] The International Atomic Energy Agency, *Code of Conduct on the Safety and Security of Radioactive Sources,* (Vienna: IAEA, 2004) https://www-pub.iaea.org/MTCD/publications/PDF/Code-2004_web.pdf
[87] *Code of Conduct on the Safety and Security of Radioactive Sources,* (Vienna: IAEA, 2004)
[88] *Code of Conduct on the Safety and Security of Radioactive Sources,* (Vienna: IAEA, 2004)
[89] The International Atomic Energy Agency, *Categorization of Radioactive Sources,* (Vienna: IAEA, July 2003), https://www-pub.iaea.org/MTCD/publications/pdf/te_1344_web.pdf
[90] *Categorization of Radioactive Sources,* (Vienna: IAEA, July 2003)

cause significant harm to humans, with even a few minutes of exposure becoming fatal.[91] Examples of items that contain Category 1 radiological material are radioisotope thermoelectric generators (RTGs), Irradiators Teletherapy Fixed, multi-beam teletherapy (gamma knife), which many of these items can be found in medical institutions.[92] While material that are considered Category 5 can be harmless in small amounts of exposure, these items can still cause health issues and even become fatal if multiple sources are built up and given prolonged exposure.[93] Examples of Category 5 material include basic x-ray machine and electrode readers.[94] The CoC's purpose is to help increase safety and security of all radiological materials, but it only offers frameworks, which specifically target materials found in Category 1–3.[95] For sources that fall in Categories 1–3, increased security measures are generally taken because the material has a higher radiation effect can cause massive health impacts.[96]

Even though every IAEA Member State approved the CoC, approximately 30 Member States have implemented or given delivery dates to meet all standards outlined in the CoC.[97] As a response, in 2004, the IAEA Board of Governors approved the Guidance on the Import and Export of Radioactive Sources to be a supplementary document to the CoC.[98] This guidance helped create an international understanding that each Member State should create its own policy for export and imports of Category 1 material, point of contact with the IAEA of all shipment of all radiological material, the evaluation of such practices, and to have this guidance reviewed and potentially revised every five years.[99] The major prerequisites for the approval of this guidance was it is still non-binding, would not impede on international or economic development and cooperation, and did not apply to nuclear material and governmental or defense matters.[100] This guidance was revised and approved in 2011 and once again in 2017.[101]

Similarly, the President of the International Conference on the Safety and Security of Radioactive Sources recommended in October 2013, "additional guidance at the international level for the long-term management of disused radioactive sources should be developed."[102] While radiological material may no longer emit the energy needed for its intended use, the radiological sources can still emit radiation until the end of their half-life and be used to create an RDD. After many meetings with technical experts and general conferences, the Board of Directors and the general body of the IAEA adopted the Guidance on the Management of Disused Radioactive Sources as another supplementary guidance to the CoC in 2017.[103] This guidance was designed to include reuse or recycling, long-term storage and disposal, and return to a supplier.[104] Similar to the CoC and the Guidance on the Import and Export of Radioactive Sources, this guidance is a non-binding agreement that is intended to help supply more technical and legal help when working with disused radioactive sources.[105] This guidance helps address the security of these radiological materials during transporting the material.

Even though the IAEA has worked to create more safeguards with protecting the storage, transportation, and disposal of radiological materials, Then-US President Barack Obama in 2009 declared nuclear terrorism as one of the greatest threats to international security.[106] This led to the creation of the first of four Nuclear Security Summits (NSS), hosted in 2010 in Washington D.C., which created commitments for participating Member States to secure

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[91] *Categorization of Radioactive Sources,* (Vienna: IAEA, July 2003)
[92] *Categorization of Radioactive Sources,* (Vienna: IAEA, July 2003)
[93] *Categorization of Radioactive Sources,* (Vienna: IAEA, July 2003)
[94] *Categorization of Radioactive Sources,* (Vienna: IAEA, July 2003)
[95] "Strengthening the Security of Radiological Sources," Nuclear Threat Initiative (2018) https://media.nti.org/pdfs/Strengthening_the_Securtiy_of_Radiological_Sources_FINAL.pdf
[96] "Strengthening the Security of Radiological Sources," Nuclear Threat Initiative (2018)
[97] The International Atomic Energy Agency, *Guidance on the Import and Export of Radioactive Sources,* (Vienna: IAEA, May 2012), https://www-pub.iaea.org/MTCD/Publications/PDF/8901_web.pdf
[98] *Guidance on the Import and Export of Radioactive Sources,* (Vienna: IAEA, May 2012),
[99] *Guidance on the Import and Export of Radioactive Sources,* (Vienna: IAEA, May 2012),
[100] *Guidance on the Import and Export of Radioactive Sources,* (Vienna: IAEA, May 2012),
[101] The International Atomic Energy Agency, *Guidance on the Import and Export of Radioactive Sources,* (Vienna: IAEA, May 2012), https://www-pub.iaea.org/MTCD/Publications/PDF/8901_web.pdf
[102] *Guidance on the Management of Disused Radioactive Sources,* (Vienna: IAEA, April 2018),
[103] *Guidance on the Management of Disused Radioactive Sources,* (Vienna: IAEA, April 2018),
[104] *Guidance on the Management of Disused Radioactive Sources,* (Vienna: IAEA, April 2018),
[105] *Guidance on the Management of Disused Radioactive Sources,* (Vienna: IAEA, April 2018),
[106] "Nuclear Security Summit at a Glance," Arms Control Association, August 2017, https://www.armscontrol.org/factsheets/NuclearSecuritySummit#2010

all vulnerable nuclear and radiological material within their borders and vulnerable material worldwide.[107] The second NSS, hosted by South Korea in 2012, focused on participating Member States increasing border security and protecting radiological sources from theft and misuse.[108] The third NSS, hosted by the Netherlands in 2014, saw the focus on tangible goals to be met by the NSS Member States. The goals established at the third NSS included: a commitment of Member States to reduce the use of highly enriched uranium and plutonium; a creation of national timeline to secure all Category 1 radiological material; for Member States to report to its citizens and the international community the measures taken for safety; and a national registration of highly radioactive material, including medical equipment.[109] In 2014, 40 percent of Member States in attendance issued a joint "Statement on Enhancing Radiological Security" to provide a specific date to secure all of their Category 1 radiological material.[110] In the final NSS hosted by the US in 2016, many of the participating members announced their respective measures towards security of radiological material and established five separate action plans for the United Nations (UN), IAEA, International Criminal Police Organization (INTERPOL), Global Initiative to Combat Nuclear Terrorism (GICNT), and the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction to carry on the work of the NSS.[111]

Case Study: CNCAN and IDDs

The Romanian National Commission for Nuclear Activities Control (CNCAN) is the certified authority of overseeing regulations of radioactive activities, radiation protection, and emergency response plans for the Member State.[112] During Romania's proposal to rejoin the European Union in the 2000s, part of the many reforms the Member States underwent was decreasing the amount of organized crime activity that was occurring in the Member State.[113] This was especially alarming due to the threat of Romania's nuclear power sources and relaxed laws on prosecuting or extraditing foreign criminals from within their border.[114] CNCAN has partnered with the National Nuclear Security Administration (NNSA) for over a decade to increase security enhancement to facilities in Romania that home radiological materials.[115] One of the major steps that CNCAN and NNSA undertook was the creation and implementation of the In-Device Delay (IDD) kits.

IDDs are kits that are stored on the devices that contain sealed radiological materials.[116] The kits are made up of different types of materials and fasteners to increase the difficulty of breaking through the kit to reach the radiological substances.[117] These kits are designed to delay the time it takes for someone to access the radiological material contained within the device up to five times more than they normally could.[118] The kits can also alert authorities once a device has been tampered with, therefore giving authorities time to respond and either recover the material quicker or capture those who are attempting to steal any substance.[119] CNCAN, in conjuncture with the NNSA, is continuing to add IDDs to many of their radiological material storage facilities in an attempt to achieve a full accountability of their radiological material. With the knowledge and increased security to prevent the loss of material has helped Romania meet many of the international goals set at the NSS in 2016.

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107 "Nuclear Security Summit at a Glance," Arms Control Association
108 "Nuclear Security Summit at a Glance," Arms Control Association
109 "Nuclear Security Summit at a Glance," Arms Control Association
110 "Nuclear Security Summit at a Glance," Arms Control Association
111 "Nuclear Security Summit at a Glance," Arms Control Association
112 "About Us," The National Commission for the Control of Nuclear Activity, https://translate.google.com/translate?hl=en&sl=ro&u=http://www.cncan.ro/&prev=search
113 "NNSA and Romania mark a Decade of Radiological Security Collaboration," National Nuclear Security Administration, April 11, 2018, https://www.energy.gov/nnsa/articles/nnsa-and-romania-mark-decade-radiological-security-collaboration
114 NNSA and Romania mark a Decade" National Nuclear Security Administration.
115 NNSA and Romania mark a Decade" National Nuclear Security Administration.
116 "Meet a Machine: Enhancing the Security of Radiological Sources through In-device Delay Kits (IDD)," National Nuclear Security Administration, May 8, 2017, https://www.energy.gov/nnsa/articles/meet-machine-enhancing-security-radiological-sources-through-device
117 "Meet a Machine: Enhancing the Security of Radiological Sources," National Nuclear Security Administration.
118 "Meet a Machine: Enhancing the Security of Radiological Sources," National Nuclear Security Administration.
119 "Meet a Machine: Enhancing the Security of Radiological Sources," National Nuclear Security Administration.

Conclusion

While both the IAEA and the international community have acknowledged the importance of proper safety and security of radiological material, there are still many gaps in security not addressed by the CoC or at the four NSSs held to date. Although some Member States have led by example to set target dates to secure all Category 1 material, there is no effective global system to address how all-radiological sources should be secured. Additionally, implementation and adherence to the standards put forth by the CoC are far from being universally accepted due to the fact there are no legally binding standards to hold Member States accountable for the entire half-life of their radiological material. This leaves open the possibility of a threat of radiological terrorism to occur during any point of the life of radiological material including storage at facilities, transportation during import and export, and disposal of material. While some standards have started to address the issue, there is still much work to be done to close the gaps that exist in international policy.

Committee Directive

While at SRMUN, delegates should focus on the issues pertaining to the securing of radiological materials at their Member State's storage or transfer facilities. Delegates should not focus on nuclear material, nuclear fission, or fissile material, or any other issues related to nuclear security. Instead, delegates should focus on the shortcomings to increase the security of the radiological facilities. While the NSS and CoC have provided framework for the basis of agreement in how to handle radiological material, the framework's language is non-binding and does not contain any enforcement or accountability measures. Even though Member States committed to securing their Category 1 materials, no other dates or goals to achieve security with the lower-category materials have been established. Additionally, only 127 of the 167 IAEA Members have committed to the CoC.[120] The CoC itself only applies to Category 1–3 of radiological material, in turn leaving a large amount of lower level radiological materials to not be included in security enhancement discussed in these frameworks. Delegates should also focus on the response from authorities to radiological material being stolen or collection of missing material. Transportation of materials still maintains a high vulnerability, depending on the method the material is shipped. Additionally, delegates can also focus on what type of radiological material used, such as caesium 137, and comparing the balance of use of these materials versus the potential of harm that can be caused.

[120] *"Strengthening the Security of Radiological Sources," Nuclear Threat Initiative (2018)*

II. The Role of Nuclear Energy in Sustainable Urbanization

Introduction

The International Atomic Energy Agency (IAEA) supports the safe use of nuclear energy and its necessity for sustainable economic growth and human welfare.[121] The IAEA assists Member States who are seeking affordable, clean, and dependable energy that reduces the negatives effects of climate change.[122] Cities are consuming about 75 percent of global primary energy, emitting approximately 60 percent of the world's greenhouse gases (GHGs), and are anticipating further increases in urbanization in the forthcoming years.[123,124] A cause for the anticipated increase of energy usage is the global urban population's growth, which is expected to reach approximately one billion people by 2030.[125] GHG emissions are also projected to increase due to population rates in dense cities.[126] According to the United Nations Department of Economic and Social Affairs (UN DESA), nearly all Member States across the international community are becoming increasingly urbanized.[127] With more than one half of the world population already living in urban areas, the UNDESA has considered this as a "global phenomenon."[128]

The IAEA, widely regarded by the UN as the world's "Atoms for Peace and Development" organization, has worked fervently towards furthering the applications of nuclear technologies to address global issues such as climate change and sustainable urbanization.[129] A primary goal of the IAEA is to determine how nuclear power can be applied as an integrated solution to provide low-carbon energy for growing urban centers.[130] To accomplish this feat, the IAEA and a number of UN agencies have banded together to underscore the uses of accessible and reliable energy in smart and megacities for cost-effective, low-carbon methods of electricity generation.[131]

Current Situation

Issues Facing Sustainable Urbanization

Urbanization is defined by the increase in the world population living within urban areas.[132] Urban areas comprise 55 percent of the world's population as of 2016, and are projected to become as high as 68 percent by 2050.[133] Collectively, these cities account for 55 percent, 73 percent, and 85 percent of gross national product (GNP) in low, middle, and high-income Member States, respectively.[134] Yet, despite the large percent of GNP generated, urbanization and urban areas may contribute up to 70 percent of total GHG emissions.[135] With the expected increase

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121 "Energy," The International Atomic Energy Agency, https://www.iaea.org/topics/energy
122 "Energy," The International Atomic Energy Agency.
123 "Energy," United Nations, https://unhabitat.org/urban-themes/energy/ (accessed July 8, 2019).
124 "Energy," United Nations.
125 Krikorian, Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization," IAEA, December 7, 2018, https://www.iaea.org/newscenter/news/at-cop-24-in-katowice-iaea-highlights-the-role-of-nuclear-power-and-energy-planning-tools-for-sustainable-urbanization.
126 Krikorian, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization."
127 "Urbanization," United Nations, May 16, 2018, https://www.un.org/en/development/desa/population/theme/urbanization/index.asp.
128 "Urbanization," United Nations.
129 Krikorian, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization."
130 Krikorian, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization."
131 Krikorian, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization."
132 "Urbanization," United Nations, May 16, 2018, https://www.un.org/en/development/desa/population/theme/urbanization/index.asp.
133 "UN: 68 Percent of World Population Will Live in Urban Areas by 2050," Phys.org, May 16, 2018, https://phys.org/news/2018-05-percent-world-population-urban-areas.html.
134 "Some Facts on Urbanization," United Nations, https://www.un.org/en/ecosoc/integration/pdf/fact_sheet.pdf (accessed April 5, 2019).
135 "Some Facts on Urbanization," United Nations.

in the global urban population to approximately reach one billion by the year 2030, the GHGs impact on urbanized areas is anticipated to grow considerably.[136] The UN has emphasized:

> *"After more than a century and a half of industrialization, deforestation, and large-scale agriculture, quantities of greenhouse gases in the atmosphere have risen to record levels not seen in three million years. As populations, economies and standards of living grow, so does the cumulative level of greenhouse gases (GHGs) emissions."*[137]

A large proportion of this estimated growth is projected to be within megacities, which are cities with populations upwards of ten million or more inhabitants.[138,139] The current human ecological footprint has become large enough; experts are considering it to be a significant indicator of a new geological epoch, coined, "the Anthropocene era."[140] These ecological footprints are especially prevalent in urban centers such as megacities, where human activity is more ubiquitous, such as Tokyo, Japan; Delhi, India; and São Paulo, Brazil. The UN projects that by 2030, the number of megacities is expected to grow from 33 in 2018 to 43.[141]

Although urban areas are considered hubs of government, transportation, and commerce, 27 of the world's 33 megacities are currently located in the less developed regions, also known as the "global South."[142] Thus, it is a goal to achieve sustainable development in megacities in order to implement innovative and efficient energy production methods, while decreasing or limiting the amount of GHGs in cities. Further, in order to meet the 1.5° C temperature increase target imposed by the Intergovernmental Panel on Climate Change (IPCC), alternative clean energy methods are a dire necessity.[143] One alternative energy source that has the potential to help achieve sustainable urbanization is the use of nuclear power. There is a projected increase in nuclear power generation from anywhere between 98 percent and 501 percent by 2050, driven by a growing population that requires more energy to sustain effectively.[144] This is an especially important consideration for the IAEA and the UN in their efforts to utilize nuclear power in sustainable urbanization initiatives.

The Center for Energy, Environmental and Technological Research (CIEMAT) is another organization that has worked as an ancillary body to the IAEA, for the purposes of sustainable development, including in the research and development (R&D) of peaceful applications for nuclear technologies.[145] CIEMAT defines smart cities as sustainable cities that are committed to their citizens and environment, and based on three basic pillars: energy, mobility, and information and communication technologies (ICT).[146] Smart cities offer an inventive approach to improve functionality, accessibility, and sustainability in urban areas. Smart cities also help to boost local economies

[136] Krikorian, Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization," IAEA, December 7, 2018, https://www.iaea.org/newscenter/news/at-cop-24-in-katowice-iaea-highlights-the-role-of-nuclear-power-and-energy-planning-tools-for-sustainable-urbanization.

[137] "Climate Change," United Nations, https://www.un.org/en/sections/issues-depth/climate-change/index.html (accessed April 13, 2019).

[138] Krikorian, Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization," IAEA, December 7, 2018, https://www.iaea.org/newscenter/news/at-cop-24-in-katowice-iaea-highlights-the-role-of-nuclear-power-and-energy-planning-tools-for-sustainable-urbanization.

[139] "MEGACITY," Definition in the Cambridge English Dictionary, https://dictionary.cambridge.org/us/dictionary/english/megacity (accessed May 23, 2019.)

[140] "THE ANTHROPOCENE: PLANET EARTH IN THE AGE OF HUMANS," October 11, 2012, https://www.si.edu/content/consortia/Anthropocene-symposium-program-11_Oct_2012.pdf.

[141] United Nations, Department of Economic and Social Affairs, *The World's Cities in 2018 – Data Booklet*, 2018, https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf.

[142] United Nations, Department of Economic and Social Affairs, *The World's Cities in 2018 – Data Booklet.*

[143] Krikorian, Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization," IAEA, December 7, 2018, https://www.iaea.org/newscenter/news/at-cop-24-in-katowice-iaea-highlights-the-role-of-nuclear-power-and-energy-planning-tools-for-sustainable-urbanization.

[144] Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization."

[145] "Smart Cities," Vértices LA REVISTA DEL CIEMAT, April 2016. http://www.ciemat.es/vertices/vertices-252016/Vertices25/pdf/vertices-25.pdf.

[146] "Smart Cities," CIEMAT.

through the investment of new technologies helping to create jobs as well as refine infrastructure to utilize energy more efficiently.[147]

Through the utilization of ICT, the Internet of Things (IoT), and nuclear technologies, the IAEA, the UN, and other intergovernmental organizations (IGOs), such as the United Smart Cities (USC) program, which seeks to implement smart city solutions for sustainable development, have continued to examine sustainable measures, such as the role of nuclear energy in smart cities, to address the challenges of global urbanization.[148] The significance of the USC global initiative is its emphasis on the importance of city review and assessment on the path of creating a more sustainable approach to urbanization. Specifically, the USC program studies and creates profiles for urban areas in order to effectuate support strategies for urban planning, project development, financial assessments, and city project and progress evaluations.[149] One of the greatest challenges facing sustainable urbanization is the continual and rapid growth of the world's population.[150] As the population grows, the amount of energy required to sustain it increases exponentially.[151] One of the more overlooked groups in sustainable urbanization are small urban communities that lay outside of mega-cities which garner larger coverage and funding for expansion and energy creation.[152]

Impacts of Nuclear Energy

Nuclear energy has shown to be beneficial to Member States and its cities within, particularly in comparison to the use of other energy sources such as coal. A single kilogram of four-percent fuel-grade enriched uranium can output the same amount of energy as 100 tons of coal.[153] One of the greatest benefits is the creation of jobs during and after the construction of nuclear power plants, as plants employ several hundred employees.[154] Growing cities require large amounts of energy to help maintain their growth as well as maintain the infrastructure, access to large amounts of reliable energy is key for sustainable urbanization.

A 2015 study conducted by the Department of Sustainability at Leuphana University sought to evaluate the relationship between nuclear energy and the economies and the development of Member States based on their approach to nuclear energy. The study examined nuclear power usage by Member States between 1960 and 2013 and examined GDP per capita, household consumption, and exports.[155] In the majority of these fields, the study indicated that those with nuclear power had higher medians than those without, or who were planning to implement, nuclear power. Member States that utilized nuclear power also showed a decrease in reliance on electricity from oil, gas, and coal source.[156] It was further noted that, on average, the unemployment rate decreased in Member States once they began producing nuclear energy.[157]

While nuclear energy solutions can greatly benefit Member States, but there is great safety concern in regards to nuclear energy in the management and disposal of nuclear materials, as well as in the decommissioning of former

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147 Cohen, "Urbanization in Developing Countries: Current Trends, Future Projections, and Key Challenges for Sustainability."
148 "Smart Cities," CIEMAT.
149 "United Smart Cities," United Smart Cities, http://www.unitedsmartcities.org/ (accessed July 11, 2019).
150 Cohen, Barney. "Urbanization in Developing Countries: Current Trends, Future Projections, and Key Challenges for Sustainability," Technology in Society, December 20, 2005, https://www.sciencedirect.com/science/article/pii/S0160791X05000588.
151 Cohen, Barney. "Urbanization in Developing Countries: Current Trends, Future Projections, and Key Challenges for Sustainability," Technology in Society, December 20, 2005, https://www.sciencedirect.com/science/article/pii/S0160791X05000588.
152 Cohen, "Urbanization in Developing Countries: Current Trends, Future Projections, and Key Challenges for Sustainability."
153 "Benefits of Nuclear Energy," ROSATOM State Atomic Energy Corporation, https://www.rosatom.ru/en/investors/benefits-of-nuclear-energy/ (accessed August 4, 2019).
154 Cohen, Barney. "Urbanization in Developing Countries: Current Trends, Future Projections, and Key Challenges for Sustainability," Technology in Society, December 20, 2005, https://www.sciencedirect.com/science/article/pii/S0160791X05000588.
155 Gralla, Fabienne, David J. Abson, Anders P. Møller, Daniel J. Lang, and Henrik Von Wehrden, "Energy Transitions and National Development Indicators: A Global Review of Nuclear Energy Production," *Renewable and Sustainable Energy Reviews* 70 (2017): 1251-265, https://www.sciencedirect.com/science/article/pii/S1364032116310711.
156 Gralla, "Energy Transitions and National Development Indicators: A Global Review of Nuclear Energy Production."
157 Gralla, "Energy Transitions and National Development Indicators: A Global Review of Nuclear Energy Production."

nuclear installations.[158] The Nuclear Energy Agency Co-operative Programme for the Exchange of Scientific and Technical Information Concerning Nuclear Installation Decommissioning Projects (CPD) was created with the objective of both exchanging and sharing information gathered from operational experience in decommissioning nuclear installations that are useful for current and future projects alike.[159] The CPD helps Member States learn how to safely remove nuclear waste and repurpose materials from decommissioned plants efficiently.[160] The CPD was created for multilateral cooperation of Member States within the Nuclear Energy Agency (NEA), an agency that specializes in cooperation between Member States regarding nuclear safety standards and technologies.[161] In 2017, the CPD had formed a task group focused on the disposal and dismantling of contaminated tanks and continues the work today.[162]

Nuclear power plants (NPPs) can possibly provide urban areas with cleaner, more efficient sources of energy. To do this, however, nuclear infrastructure must be measured in such a capacity as to prevent epidemics such as radioactivity in drinking water and other radioactive exposures, as "ionizing radiation produces detrimental biological effects."[163] There are currently NPPs operating in 30 different Member States with over 50 Member States receiving the benefits from these reactors through energy exports.[164] South Korea is home to the third largest NPP in the world, the Hanul Nuclear Power Plant.[165] This is the largest of the 23 reactors in South Korea that account for 27 percent of Member State's total energy production.[166] South Korea is one of the largest producers of nuclear energy in the world with several more domestic reactors currently in construction as well as assisting in the creation of nuclear energy for the United Arab Emirates.[167] As of 2017, Belgium was able to produce 50 percent of their total energy from seven operational reactors, whereas France was able to produce 72 percent of their total energy from 58 reactors.[168]

Regardless of the precautions taken by the IAEA to ensure the safe and secure applications of nuclear science and technologies, widespread stigmatization surrounding its usage still exists. The term "nuclear" has maintained a negative connotation due to its association in a number of incidents, including dirty bombs and radiation poisoning.[169] Nuclear-related catastrophes, including the atomic bombings of Hiroshima and Nagasaki, Japan, in 1945; the Chernobyl nuclear reactor disaster in 1986; the nuclear reactor incident in Fukushima, Japan, in 2011; and other cases of nuclear waste pollution have further prompted caution in utilizing nuclear technologies.[170, 171]

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158 "Safety of Nuclear Power Reactors," World Nuclear Association, May 2018, http://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors.aspx.

159 "The NEA Co-operative Programme for the Exchange of Scientific and Technical Information Concerning Nuclear Installation Decommissioning Projects (CPD)," Nuclear Energy Agency, February 13, 2019, https://www.oecd-nea.org/jointproj/decom.html.

160 "The NEA Co-operative Programme for the Exchange of Scientific and Technical Information Concerning Nuclear Installation Decommissioning Projects (CPD)," Nuclear Energy Agency.

161 "The NEA Co-operative Programme for the Exchange of Scientific and Technical Information Concerning Nuclear Installation Decommissioning Projects (CPD)," Nuclear Energy Agency.

162 "The NEA Co-operative Programme for the Exchange of Scientific and Technical Information Concerning Nuclear Installation Decommissioning Projects (CPD)," Nuclear Energy Agency.

163 National Research Council (US) Safe Drinking Water Committee. "Radioactivity In Drinking Water." Drinking Water and Health: Volume 1. January 01, 1977. Accessed April 15, 2019. https://www.ncbi.nlm.nih.gov/books/NBK234160/.

164 "Nuclear Power in the World Today," World Nuclear Association, February 2019, http://www.world-nuclear.org/information-library/current-and-future-generation/nuclear-power-in-the-world-today.aspx.

165 "Largest Nuclear Power Plants: Ranking the Top Ten by Capacity," Power Technology | Energy News and Market Analysis. June 26, 2019, https://www.power-technology.com/features/feature-largest-nuclear-power-plants-world/.

166 "Nuclear Power in the World Today," World Nuclear Association, February 2019, http://www.world-nuclear.org/information-library/current-and-future-generation/nuclear-power-in-the-world-today.aspx.

167 "Nuclear Power in the World Today," World Nuclear Association.

168 "Nuclear Power in the World Today," World Nuclear Association.

169 Ervin, Elizabeth K, "Nuclear Energy: Statistics," http://home.olemiss.edu/~cmchengs/Global%20Warming/Session%2017%20Nuclear%20Energy%20-%20Statistics/Nuclear%20Energy.pdf (accessed May 23, 2019).

170 "A Brief History of Nuclear Accidents Worldwide," Union of Concerned Scientists, https://www.ucsusa.org/nuclear-power/nuclear-power-accidents/history-nuclear-accidents (accessed May 23, 2019).

171 "Radioactive Waste - Myths and Realities," World Nuclear Association, May 2017, https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-wastes/radioactive-wastes-myths-and-realities.aspx (accessed May 23, 2019).

Actions Taken by the IAEA

Due to the diverse perceptions of nuclear technologies, both security and safety of nuclear material are of utmost importance in determining how to successfully integrate nuclear power into methods of sustainable urbanization. In order to make safe and smart decisions, the IAEA has worked with a number of partner organizations for the purpose of information gathering, resource allocation, and global initiatives.[172] The NEA, a subsidiary of the Organization for Economic Co-operation and Development (OECD), is "an intergovernmental agency that facilitates cooperation [amongst] Member States with advanced nuclear technology infrastructures to seek excellence in nuclear safety, technology, science, environment and law."[173] The IAEA has worked with the NEA and its two subcommittees, which comprise the NEA's nuclear safety and regulation segments: the Committee on the Safety of Nuclear Installations (CSNI), and the Committee on Nuclear Regulatory Activities (CNRA). These subcommittees help establish joint projects and information exchange programs for states under the support of the NEA.[174] This research helps Member States to make informed decisions when developing technologies for their cities.

Together, the CSNI and CNRA have made strides to utilize valuable ICTs in a joint initiative called the NEA Computer-based Systems Important to Safety (COMPSIS) Project that took place from January 2005 to December 2011.[175] The objective of this project is to "contribute to the improvement of safety management and to the quality of software risk analysis for software-based equipment."[176] The initiative was primarily founded in order to, "define a format and collect software and hardware fault experience in computer-based safety critical Nuclear Power Plant (NPP) systems in a structured, quality-assured and consistent database."[177] The collection of this vital ICT data allows the project to gain insight into the root causes of nuclear events and develop measures to prevent and/or combat them.[178] Without proper design nuclear power plants may struggle to keep up with the growth of a city causing more resources to be required to compensate for this unanticipated growth.

In Katowice, Poland, on December 3, 2018, the United Nations Framework Convention on Climate Change (UNFCCC) gathered to hold its 24th annual conference (COP 24), where 196 Member States and the European Union (EU) came together to further discuss alternative global power solutions.[179] The conference primarily highlighted nuclear power and energy planning tools for sustainable urbanization.[180] During the conference, the IAEA accentuated the significance of nuclear applications and energy planning tools to achieve reliable access to energy in smart and megacities in its pursuit for sustainable urbanization.[181] The conference equipped Member States with outlines describing the most effective way for them to utilize energy technologies in ways that would help them achieve the goals outlined in the Paris Agreement, such as setting clear deadlines for solutions to be implemented and consistently reviewing their technologies both internally as well as with other Member States to ensure the efficiency of their work.[182] The conference provided Member States with a communication framework for the research and review of nuclear technologies pertaining to Article 7 of the Paris Agreement, which Member

[172] "Collaboration with International Partners," IAEA, June 6, 2017, https://www.iaea.org/topics/energy-planning/collaboration.

[173] "About Us - The Nuclear Energy Agency," Nuclear Energy Agency, https://www.oecd-nea.org/general/about/ (accessed April 17, 2019)

[174] "Nuclear Safety Technology and Regulation," Nuclear Energy Agency, https://www.oecd-nea.org/nsd/ (accessed April 14, 2019).

[175] "The NEA Computer-based Systems Important to Safety (COMPSIS) Project," Nuclear Energy Agency, October 14, 2013, https://www.oecd-nea.org/jointproj/compsis.html.

[176] "The NEA Computer-based Systems Important to Safety (COMPSIS) Project," Nuclear Energy Agency.

[177] "The NEA Computer-based Systems Important to Safety (COMPSIS) Project," Nuclear Energy Agency.

[178] "The NEA Computer-based Systems Important to Safety (COMPSIS) Project," Nuclear Energy Agency.

[179] Krikorian, Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization," IAEA, December 7, 2018, https://www.iaea.org/newscenter/news/at-cop-24-in-katowice-iaea-highlights-the-role-of-nuclear-power-and-energy-planning-tools-for-sustainable-urbanization.

[180] Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization."

[181] Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization."

[182] "The Katowice Texts," UNFCCC, December 14, 2018, https://unfccc.int/sites/default/files/resource/Katowice%20text%2C%2014%20Dec2018_1015AM.pdf.

States are asked to create a national framework for maintaining communication with other Member States about nuclear technologies.[183]

The COP 24 discussions further spotlighted two particular UN Sustainable Development Goals (SDGs) and their connection with integrating nuclear energy for sustainable urbanization. They discussed Goal 7 (ensuring access to affordable, reliable, sustainable and modern energy for all) and Goal 11 (making cities and human settlements inclusive, safe, resilient and sustainable), in their relation to responding to urban energy challenges.[184] Member States also established the Katowice Rulebook, which implemented specific areas of the UNFCCC Paris Agreement, including provisions in Articles 4 focused on curbing the peak of greenhouse gas emissions as soon as possible and recognizing that this will take longer for developing Member States.[185] The Rulebook further touched upon the aspects of finance, adaptation, and transparency.[186] Since the COP 24 event, the IAEA has exercised its responsibility of monitoring nuclear applications in order to enact a more hands-on role in addressing sustainable urbanization and the fight against climate change.

Apart from the IAEA's pivotal role in advocating the role of nuclear energy for sustainable urbanization at COP24, as an autonomous organization, the IAEA has made strides towards at least nine of the 17 UN SDGs, with objectives in areas including energy, water management, food production, infrastructure, and environmental protection.[187] Further, the IAEA was able to enact a more pivotal role in addressing sustainable urbanization and fighting climate change by monitoring nuclear applications for sustainable uses.

Conclusion

As UN Secretary-General António Guterres stated at the High-Level Event on Climate Change in September 2018, "Climate Change is the defining issue of our time and we are at a defining moment."[188] Thus, it has remained a primary objective of the IAEA to promote the peaceful applications of nuclear technologies for sustainable development in order to aid Member States through capacity building.[189] Sustainable urbanization has become an increasingly important subject for the IAEA, with nuclear energy becoming more widely available, and its use more plausible and in higher demand.[190] As nuclear technology becomes increasingly prevalent, the IAEA must continue to monitor and endorse safe and environmentally conscious solutions in its applications of nuclear energy in order to achieve these goals. The challenges of sustainable urbanization need to account for the difference in infrastructure between Member States and address each one in a way that best suits them rather than trying to build around one single solution. Utilizing nuclear energy in the most effective manner possible will help to ensure that Member States can fully reap the benefits of sustainable urbanization.

IAEA Deputy Director General Mikhail Chudakov once said, "if nuclear power deployment doesn't expand in line [to achieve these projected goals], ... other technologies may not fill the gap – and Member States may not meet their climate targets."[191] In order to successfully overcome the challenges facing the uses of nuclear energy in

[183] "The Katowice Texts," UNFCCC.

[184] Krikorian, Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization," IAEA, December 7, 2018, https://www.iaea.org/newscenter/news/at-cop-24-in-katowice-iaea-highlights-the-role-of-nuclear-power-and-energy-planning-tools-for-sustainable-urbanization.

[185] "The Katowice Texts," UNFCCC, December 14, 2018, https://unfccc.int/sites/default/files/resource/Katowice%20text%2C%2014%20Dec2018_1015AM.pdf.

[186] "Success of COP24 – We Have the Katowice Rulebook," COP 24 Katowice 2018, December 15, 2018, https://cop24.gov.pl/news/news-details/news/success-of-cop24-in-katowice-we-have-a-global-climate-agreement/.

[187] "Sustainable Development Goals (SDGs)," IAEA, June 8, 2016, https://www.iaea.org/about/overview/sustainable-development-goals.

[188] "Climate Change," United Nations, https://www.un.org/en/sections/issues-depth/climate-change/index.html (accessed April 13, 2019).

[189] Dimidis, Ismini. "What Nuclear Technology Can Offer to Address Climate Change: Conclusions of the Scientific Forum," September 21, 2018, https://www.iaea.org/newscenter/news/what-nuclear-technology-can-offer-to-address-climate-change-conclusions-of-the-scientific-forum.

[190] The International Atomic Energy Agency, *The Statute of the IAEA,* February 23, 1989, Article 3.

[191] Krikorian, Shant, "At COP 24 in Katowice, IAEA Highlights the Role of Nuclear Power and Energy Planning Tools for Sustainable Urbanization," IAEA, December 7, 2018, https://www.iaea.org/newscenter/news/at-cop-24-in-katowice-iaea-highlights-the-role-of-nuclear-power-and-energy-planning-tools-for-sustainable-urbanization.

sustainable urbanization, the body of the IAEA must draft effective and unprecedented resolutions, which may include agendas to destigmatize “nuclear,” take the lead on the fight against climate change, ensure nuclear safety and security in heavily populated locations, utilize capacity building techniques, and end unsustainable urbanization practices. In order to do this, the IAEA must remain consistent to its primary objective: promote the peaceful development of fissionable material, while simultaneously devising innovative and inclusive ways to access a more sustainable future for the Earth and all its cities.

Committee Directive

With the help of Member States and real-world case studies of successful nuclear applications, the IAEA must also aim towards furthering new avenues of R&D. The IAEA can foster innovative and sustainable methods in which all citizens might prosper. The innovation of new technologies and methods of urbanization should take into account the needs and hindrances of all Member States and be flexible in their applications so as to benefit the whole. Delegates should identify the role urbanization has had within their Member State. What efforts have been made to ease concerns or restrictions as a result of rapid population growth? Delegates should focus on how nuclear energy can be applied to sustainable urbanization in the most effective and safe manner. What existing measures are in place in their Member State? Are there bilateral or multilateral programs from your Member State, including with partnerships with nongovernmental organizations, that could benefit fellow Member States? Delegates should take into account the challenges and differences developed and developing Member States have witnessed while addressing this topic. Delegates should also recognize the variation in access to current nuclear technologies between Member States and the availability of resources necessary for the creation of a nuclear program. The shortcomings of nuclear energy should be considered and how it can be addressed to help in sustainable urbanization. Existing infrastructure should be accounted for when discussing sustainable urbanization and how to properly utilize it to reduce the burden the creation of new infrastructure could place on developing Member States.

Annotated Bibliography

Topic I: Strengthening the Security of Radiological Material Facilities

"Book of Synopses - International Conference on the Security of Radioactive Material The Way Forward For Prevention and Detection", *International Atomic Energy Agency*. Vienna, Austria 3-7 December 2018, https://www.iaea.org/sites/default/files/18/12/cn-269-synopses.pdf

> The International Atomic Energy Agency (IAEA) report contains a myriad of abstracts presented at the International Conference on the Security of Radioactive Material. Many of the abstracts contain links to larger papers but this report is extremely useful to delegates as many of the abstracts give knowledge into other programs, initiatives, and ideas around increasing security of facilities housing radiological materials. Delegates are recommended to review the following three abstracts, but are encouraged to read about as many as possible. *Drive in Strengthening the Security of Radioactive Materials in Bangladesh* discusses the many agencies Bangladesh has created, such as the Nuclear Safety and Radiation Control (NSRC) which has required facilities to meet high security standards before issuing any licenses. *Upgrade of Security of Radiological Facilities in Ghana* details the approaches Ghana has taken to meet the guidelines from Nuclear Security Series No. 11 (NSS 11) on improving security at facilities by improving the safeguard of personnel, information, equipment, information-technology (IT) infrastructure, and other company assets. *Computer Security for Radiological Facilities* is especially interesting to delegates as is discusses the importance that network-based communication can be helpful in protecting radioactive sources but also makes them increasingly more vulnerable to cyberattacks.

Bieniawski, A; Illiopulos, I; Nalabandian, M; "Radiological Security Progress Report: Preventing Dirty Bombs – Fighting Weapons of Mass Disruption," *The Nuclear Threat Initiative*, 2016. https://media.nti.org/documents/NTI_Rad_Security_Report_final_0916.pdf

> A great tool to give delegates an understanding of the threat of security of radiological materials were in 2016. This report dives gives a great context of the IAEA Code of Conduct on the Safety and Security of Radiological Sources (CoC) as well as highlights the major goals decided on at the NSS14. In addition to analyzing the CoC and NSS14, the report gives recommendations for improving radiological security. Delegates can look to this report to see ideas about how to strengthen regulatory framework internationally, including improving the CoC and strengthening the role of IAEA. It also calls for increasing the development of more alternative technologies to replace current technologies that use radiological materials such as caesium-137.

Cogliani, Leland. "Initiatives to Strengthen Nuclear and Radiological Security Efforts." *Arms Control Association*, August 2018, https://www.armscontrol.org/act/2018-07/features/initiatives-strengthen-nuclear-radiological-security-efforts.

> Leland Cogliani explains the initiatives that the United States (US) Department of Energy and the National Nuclear Security Administration (NNSA) could do to help increase safety and security for the US and meet expectations outlined in the Nuclear Security Summits. Three initiatives were recommended, starting with the Nuclear Security Crosscut Initiative, a Proliferation Detection Consortium, and a Radiological Eliminate and Secure initiative. The latter details a plan to secure the final high-level radiological materials in the Member State in the next five years. The article also discusses previous initiatives to replace radiological technologies, such as blood irradiators using caesium-137 with non-radiological x-rays. These initiatives could help improve national security, prevent any radiological threats, and galvanize nonproliferation efforts.

Dojcanova, Lenka. "IAEA Kicks off New Phase of Project Strengthening Regulatory Infrastructure for Radiation Safety and Nuclear Security in Latin America and the Caribbean," *International Atomic Energy Association: Department of Nuclear Safety and Security*, Vienna, Austria 08 May 2019. https://www.iaea.org/newscenter/news/iaea-kicks-off-new-phase-of-project-strengthening-regulatory-infrastructure-for-radiation-safety-and-nuclear-security-in-latin-america-and-the-caribbean

Lenka Dojcanova discusses the second phase of the IAEA Regulatory Infrastructure Development Project (RIDP) in Latin America and the Caribbean that aims to help 14 Member States strengthen national regulatory infrastructure for radiation safety and nuclear security. These initiatives are designed to help Member States create the infrastructure to secure radiological material and how to respond any issues that arise. The RIDP utilizes regional and national technical cooperation programmes (TC). Delegates can use this article to see tangible programs that are being used for lower developing countries improve to regulate activities such as radiology, nuclear medicine, radiotherapy, industrial radiography, industrial irradiators, nuclear gauges and well logging. Delegates can also see how the TC programmes have helped these Member States achieve more of the IAEA Safety Standards, the NSS, and the CoC, and its supplementary guidance documents.

Koenig, K; et al.; "Medical Treatment of Radiological Casualties: Current Concepts," *Annals of Emergency Medicine,* 45:6 p643-652, June 2005. https://www.sciencedirect.com/science/article/pii/S0196064405000867

Koenig discusses what the health effects of a radiological terrorist event would be like and what preparedness would look like for physicians. This article does indicate that in the event of radiological incident, that traditional medical and surgical triage take precedent over exposure management and decontamination. However, the article argues that physicians need to be more open in treating those who show any signs of radiation sickness. Physicians generally understand external radiation sickness but are slower to be able to diagnose or understand the symptoms of acute radiation syndrome (ARS). It also encourages health policies that physicians have plans to also have available for the proper countermeasures to ARS, addressing the psychosocial implications of radiation incidents, and improving decision making in when to evacuate versus take shelter after a radiological incident. Delegates can find this article helpful in researching the health effects and develop plans for a health response to those exposed to radiological incidents.

Topic II: The Role of Nuclear Energy in Sustainable Urbanization

Climate Change and Nuclear Power 2018. International Atomic Energy Agency, 2018, https://www-pub.iaea.org/MTCD/Publications/PDF/CCNAP-2018_web.pdf

Climate Change and Nuclear Power is a report produced on an annual basis by the IAEA This report analyzes global trends in greenhouse gas emissions, its impact on climate change, and how it might be mitigated through "greener" technologies under the IAEA's purview, most notably, nuclear power and technology. Areas of note are updated data on anthropogenic interference with the climate system, the role of the United Nations (UN) in forming climate policy and its relevance to nuclear power proliferation, and the challenges and potential of further nuclear power development -- an especially important reference point when considering the IAEA's role in sustainable urbanization. The report also acknowledges the most recent nuclear power accident at Fukushima Daiichi plant in Japan, through analyzing possibilities and implemented measures since the accident to prevent a similar situation in the future. Additionally, in an effort to address the variety of obstacles posed toward Member States of varied developmental status, Part Five of the report addresses the development of reactors with alternative cost models. With these considerations in mind, Member States can incorporate past and present nuclear information within this report when crafting resolutions for sustainable urbanization initiatives.

"Emerging Nuclear Energy Countries." *Emerging Nuclear Energy Countries | New Nuclear Build Countries - World Nuclear Association,* World Nuclear Association, March 2019, www.world-nuclear.org/information-library/country-profiles/others/emerging-nuclear-energy-countries.aspx.

The World Nuclear Association provides an overview of emerging nuclear energy Member States, and their current status within nuclear facility planning and development. While many Member States acknowledge the benefits to nuclear power generation, this article highlights the substantial hindrances to those Member States who do not already have established nuclear programs. One issue is the size of their current grid systems, which, as they had previously been designed and constructed for fossil fuel energy production, is too small to efficiently handle and nuclear energy generation and distribution. A second issue is that of licensing reactor designs, of which these emerging Member States do not have the expertise in their own Member State and often have to look elsewhere, adding to the cost of developing this energy source. For developing regions with booming populations that are quickly beginning to urbanize or move to urban areas and therefore expanding their size, these obstacles are important to note in the aid of sustainably supporting them. Last, this source gives an overview of IAEA initiatives that have been established in support of nuclear program establishment and safety, such as the Nuclear Energy Systems Assessment (NESA), Integrated Nuclear Infrastructure Review (INIR), Site and External Events Design (SEED), and the Integrated Regulatory Review Service (IRRS).

Carreon, J; Worrell, E; "Urban Energy Systems Within the Transition to Sustainable Development. A Research Agenda for Urban Metabolism" *Resources, Conservation and Recycling* 132: p258-266. Science Direct, May 2018. https://www.sciencedirect.com/science/article/pii/S0921344917302434

Carreon and Worrell discuss how urban energy systems can help urban cities better achieve sustainable development. While focusing on five aspects of energy management for urban areas, the article highlights how rethinking the way energy flows through a city can help make sustainable energies attainable. Carreon and Worrell argue that instead of viewing energy sectors and cities separately by function, all cities should flow as a single system. When understanding what a whole region or city needs and designing the energy system. This article is helpful for delegates to understand some of the main aspects that any sustainable energy sources would need to be successful and could take lessons from this article and apply it to installing nuclear energy in these functions.

"The World's Cities in 2018." United Nations, 2018, https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf

The World's Cities in 2018 data booklet by the UN's Department Economic and Social Affairs details the most recent statistics and developments of urban areas within Member States throughout the last decade. This report provides useful data for delegates, including definitions, graphs, and maps, perfect for the visual learner. The data booklet also provides case studies with special focus on the "global south," which includes Asian and African studies. The 28-page report offers delegates a comprehensive and simplistic overview of the world's urbanization dilemma, and functions as an ideal resource to utilize prior to diving into the background guide. This source also provides a significant amount of Member State background information for delegates to use in while crafting their position papers.

Prăvălie, Remus, and Georgeta Bandoc. "Nuclear Energy: Between Global Electricity Demand, Worldwide Decarbonisation Imperativeness, and Planetary Environmental Implications." *Journal of Environmental Management*209 (March 2018): 81-92. Accessed July 13, 2019. https://www.sciencedirect.com/science/article/pii/S0301479717312227.

Prăvălie and Bandoc analyze and discuss the climatic, economic, and environmental viability of nuclear energy on a global scale. The article examines the evolution of nuclear energy from its initial inception in the early 50s when the first nuclear reactor was created up to the state of modern-day nuclear energy and nuclear energy systems. Using the IAEA's Power Reactor Information System, Prăvălie and Bandoc breakdown the number of reactors and energy generated by region. Europe has over half of the 30 Member States that currently use nuclear energy and maintain their own nuclear reactors but the global amount of reactors is expected to jump as several Member States such as China are currently in the process of building new reactors to keep up with growing energy demand. Nuclear energy is considered to be a viable option to aid in decarbonization but Prăvălie and Bandoc also examine and address concerns related to the waste produced by nuclear power plants and the risk of nuclear accidents at plants. This article is a good source for understanding the current climate surrounding nuclear energy and its global presence today. Understanding these will help delegates to determine best practices for future nuclear energy plans and how to effectively implement them in relation to sustainable urbanization.