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ARTICLE NO- 1

TOPIC: DIGITAL ENVIRONMETAL DISPUTE RESOLUTION

SUB TOPIC: VIRTUAL SOLUTION FOR ENVIRONMENTAL CONFLICTS: FUTURE OF DISPUTE RESOLUTION.

ABSTRACT

Environmental concerns present serious difficulties around the world and call for Creative Solutions. A range of virtual technology and approaches, such as "online dispute resolution platform" artificial intelligence tools, Blockchain, Remote Sensing virtual reality, are used to resolve the problem virtually. This study focuses on the effect of virtual solutions in Environmental governance by taking issues of cyber security privacy and fair access to technology into account. The increasing complexity and number of cases related to environmental conflict necessitate innovative approaches to remove the hindrance of traditional dispute resolution methods. Digital environment dispute resolution offers a more efficient, effective, accessible and fair Framework for resolving disputes with the help of AI,

Virtual mediation tool and leverages advanced digital platforms. This paper further deals with potentials to address conflicts effectively, effectiveness of virtual mechanisms and its impact on stakeholder engagement, marginalized commun*ities.* The study examines existing policy and regulatory frameworks and proposes new regulations to facilitate the integration of virtual solutions. An interdisciplinary approach that integrates environmental science, law, technology, and social sciences is evaluated. The challenges of cybersecurity and data privacy are addressed, with recommendations for ensuring secure virtual platforms. Equity and accessibility issues are investigated, providing solutions to increase participation for underrepresented groups. Comparative studies across regions identify best practices, while future trends and scenarios in virtual dispute resolution are investigated to forecast future challenges and opportunities. This comprehensive research seeks to provide insights into the current landscape and future potential of virtual solutions in managing environmental conflicts.

INTRODUCTION

> "Sustainable development is the pathway to the future we want for all. It offers a framework to generate economic growth, achieve social justice, exercise environmental stewardship and strengthen governance." - Ban Ki-moon[1]

Effect of Human activity on the natural environment dealt with by environmental law provides a framework to deal with challenges due to loss of biodiversity, Pollution, natural resource exploitation, and climate change. Individuals, communities and nations add complexity in resolution of dispute in this area; however despite complexity there are mechanisms like online dispute resolution to resolve the environmental issue and conflict.

[1] Ban Ki-moon, Sustainable Development is the Pathway to the Future We Want for All, United Nations (2013).

Today the emerging modern world requires modern solutions with the availability of internet facilities. Everything is going virtual from bill payment to dispute resolution etc. working virtually saves cost as well as environment. ODR (online dispute redressal) is fast and efficient as compared to traditional litigation and online alternative dispute resolution is developing with the help of Internet and technology.

Environmental conflict possesses local regional National and global security in threat. There is a varied and complex association between environment and conflict and this causes varies across the globe. Environmental conflict may harm humans as well as the base of natural resources, development of the country. Law is, at its heart, a dispute resolution mechanism but concern is how disputes are resolved. The biggest weakness of judiciary in resolving disputes is that it is time consuming which ultimately leads to wastage of our human resource which has also impact on environment and lead to conflict in environment with the realm of time "online dispute resolution" as a leading tool which helps in resolving environmental dispute. ODR represents a mixture of alternative dispute resolution aid and modern technology. Use of artificial intelligence in dispute resolution has grown in concurrence with ODR.

In recent years, the intersection of technology and environmental conservation has created new opportunities for addressing some of our planet's most pressing challenges. One such development is the introduction of Online Dispute Resolution (ODR), which represents a promising alternative to traditional methods of resolving environmental disputes. As the world becomes more digital, the potential for ODR to contribute to environmental sustainability gains traction. This paper investigates the role of Virtual Environmental Dispute Resolution (VEDR) in environmental conservation, focusing on its benefits in terms of reducing ecological footprints, increasing accessibility, and fostering efficient environment conflict resolution.

Environmental disputes usually involve complex, multifaceted issues that require prompt and effective resolution to prevent further degradation of natural resources. Traditional dispute resolution mechanisms, such as litigation and arbitration, are not only expensive and time-consuming, but they also cause environmental damage due to extensive paperwork, travel, and the upkeep of large physical infrastructures. In contrast, VEDR[2] uses digital platforms to help resolve disputes, providing a more environmentally conscious and effective approach.

ODR provides a virtual platform for parties to negotiate, mediate, and arbitrate without any requirement for physical presence. This digital approach has numerous advantages over traditional methods, including improved accessibility for geographically dispersed

[2] Virtual Environmental Dispute Resolution.

stakeholders, lower environmental impact due to reduced travel and paper use, and increased time and cost efficiency. ODR ensures efficient interaction and cooperation among parties by using tools such as video conferencing, digital file sharing, and real-time messaging, developing an environment conducive to dispute resolution.

This paper investigates how ODR can be used effectively to resolve environmental conflicts, emphasizing its environmental benefits, improved access to justice, and an opportunity to facilitate global and cross-border dispute resolution. By looking at case studies and current applications of ODR in environmental contexts, we hope to demonstrate its effectiveness and advocate for its wider adoption as a critical tool in advancing the goal of sustainable and equitable environmental governance.

I. A SPIKE IN DISPUTES REGARDING THE ENVIRONMENT.

Over the past century, environmental issues have transcended national boundaries, affecting people worldwide. Climate change, pollution, and rising sea levels are unprecedented global issues. Disruptions like these pose Rapid changes in competition for scarce resources and pose significant threats to many countries, outpacing our ability to adapt. Environmental changes have accelerated disasters, threatening humanity's survival. Environmental damage can lead to the following issues:

a. Land and water: Environmental issues can exacerbate land disputes. Water scarcity can result from land becoming less fertile or infertile, as well as flooding.

b. Food security: Rising sea levels and reduced rainfall can reduce agricultural production and cultivable land, potentially leading to civil unrest and competition for consumption.

c. Migration and displacement: Lack of arable land and water scarcity can cause widespread migration, resulting in a variety of issues. Host-migrant animosity can lead to resource competition, posing a major issue.

d. Inequality and injustice: These are major causes of conflict, and environmental issues exacerbate this divide. One major reason could be that a specific segment of the population is affected.

II. ONLINE DISPUTE RESOLUTION.

The term "Online Dispute Resolution (ODR)" refers to various online dispute resolution methods that use ADR[3]. The online dispute resolution mechanism complements existing ADR methods by assuming that some disputes, preferably e-disputes, can be resolved

[3] Alternative dispute resolution (ADR) refers to the different ways people can resolve disputes without a trial.

expeditiously and suitably using the Internet. ODR uses computer networks and applications to resolve disputes through alternative dispute resolution (ADR).

Currently, there are four types of ODR systems:

a. Online settlement: financial disputes are automatically resolved using an expert system.

b. Online arbitration: the resolution of disputes by qualified arbitrators via a website.

c. Online mediation involves qualified mediators resolving disputes through a website.

d. E-mail-based resolution of consumer complaints for specific types. However, the majority of these methods are not fully developed. However, with technological advancements, they can be used to resolve both online and in-person disputes.

III. INDIA AND DIGITAL ENVIRONMENTAL DISPUTE RESOLUTION

The National Green Tribunal[4] (NGT) Online Portal:

The NGT, formed under the National Green Tribunal Act of 2010, has created an online site for filing cases, viewing case information, and tracking the status of environmental disputes. This tool allows stakeholders to participate in dispute resolution processes digitally. The NGT's online portal is a web-based platform designed to handle environmental matters in India expeditiously. It allows consumers to submit complaints, petitions, and applications about environmental issues electronically. The portal enables online document filing, case status tracking, and access to the NGT's judgements and orders. This digital infrastructure improves transparency, accessibility, and accountability in environmental adjudication, leading to more efficient legal processes and better environmental governance.

- Case Filing: The portal allows users to online submit complaints, petitions, and applications connected to environmental issues.

[4] It is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues.

- Document Submission: It enables online submission of supporting documents and evidence for environmental claims.
- Case Tracking: Using the platform, parties involved in cases can monitor the status of their petitions and applications, ensuring transparency and timely information.
- Access to Judgements and Orders: The site provides access to the NGT's judgements, orders, and decisions on a variety of environmental issues.
- Access to verdicts and Orders: The website provides access to the NGT's verdicts, orders, and decisions on a wide range of environmental matters.

Overall, the NGT web portal aims to increase transparency, accessibility, and efficiency in environmental litigation, thereby bolstering the NGT's role in environmental protection and sustainable development in India.

E-Courts:

Several courts in India, notably those dealing with environmental cases, are rapidly implementing e-court projects. This includes digitizing case records, allowing for electronic filing of petitions, and holding virtual hearings, which reduces paperwork and improves accessibility for litigants. Environmental disputes, which include disagreements over resource allocation, pollution control, biodiversity conservation, and climate change mitigation, are becoming more common and complex. Traditional court systems frequently struggle with the volume and complexity of these cases.

E-courts, or electronic courts, provide a modern solution that uses digital technology to improve the efficiency, accessibility, and transparency of the judicial process. This section investigates the role of e-courts in resolving environmental disputes and their implications for environmental governance.

- **E-filing and managing documents:** Digital filing, or e-filing, is a technique used by e-courts that enables parties to electronically file complaints, responses, evidence, and other legal documents. Large document volumes, which are frequently the case in environmental issues, can involve technical reports, impact assessments, and regulatory compliance records. These solutions simplify the process of maintaining these kinds of data.

- **Platforms for Online Dispute Resolution[5] (ODR):** ODR systems created especially for environmental conflicts may be used by e-courts, offering a structured online setting for negotiation, arbitration, and mediation. These online forums can help with communication, sharing of documents, and settlement without requiring in-person court appearances.
- **Virtual Trials and Hearings:** Video conferencing tools are used by e-courts to conduct hearings and trials, which facilitates participation by parties from distant places. Even in cases when parties or experts are geographically separated, environmental issues can be expeditiously resolved thanks to virtual hearings.
- **Digital Evidence and Expert Testimony Accessibility:** Digital evidence such as multimedia, satellite images, GIS data, and environmental impact models can be submitted and presented in e-courts. Expert witnesses can testify remotely and efficiently convey difficult scientific and technological information by utilizing digital tools.
- **Systems for managing cases:** E-courts can track and handle environmental cases more effectively with the use of sophisticated case management tools. By automating scheduling, deadlines, and document retrieval, these technologies can improve case management in its entirety. They make certain that cases follow all legal and procedural standards and are processed promptly.
- **Transparency & Public Access:** By posting schedules, case information, and court rulings online, e-courts increase transparency. Accountability is encouraged and environmental justice is made visible and available to all parties involved thanks to this public access. When appropriate, digital tools can also let the public participate in environmental decision-making processes.

Digital Case Management and Control:

- **Integrated Case Management Information System (ICMIS):** Environmental dispute tracking and management are made easier with the use of ICMIS. It facilitates speedier resolution by offering a centralized platform for case information.

[5] https://www.sama.live *Environmental Law Journal* (2024

- **Supreme Court Website[6] and High Court's Website:** Websites for the Supreme Court and a number of high courts in India have been modified to offer online case status updates, e-filing capabilities, and judgements. These tools are essential for efficiently handling environmental caseloads.

Use of Technology for the Presentation of Evidence

- **Geographic Information Systems (GIS):** To present and evaluate environmental evidence, Indian courts—the NGT in particular—are adopting GIS and other digital technologies more and more. This aids in comprehending the geographical components of environmental problems.
- **Remote sensing and satellite imagery:** Remote sensing and satellite imagery are two technologies that are used to evaluate the effects of development projects and track environmental compliance. They can serve as vital proof in legal cases.

Training and Capacity Building:

- **Judicial Training Programmes:** Judges and court employees can participate in training sessions on the use of digital tools and technologies from the National Judicial Academy and many state judicial academies. Modules on managing digital evidence and comprehending environmental rules and regulations are included in these programmes.
- **Workshops and Seminars:** To keep the legal community and judiciary informed about the most recent advancements in digital technology and environmental legislation, periodic workshops and seminars are held.

Transparency and Public Participation[7]:

- **Public Information Access:** By giving the public access to information regarding current and settled environmental conflicts, digital platforms improve accountability and transparency.

[6] https://www.sci.gov.in
[7] https://moef.gov.in/moef/index.html

- **Platforms for Citizen Engagement:** A number of state governments and environmental organizations have created online tools that let people report environmental infractions and follow up on their concerns.

Partnerships and Collaboration:

- **Partnerships with Tech Companies and NGOs[8]:** To create and execute digital solutions for environmental dispute resolution, the Indian judiciary partners with tech firms and non-governmental organizations.
- **Academic and Research Institutions:** Collaborations with these establishments aid in the creation of specialized digital tools and the carrying out of research aimed at enhancing environmental dispute settlement procedures.

IV. APPLICATION

Use of digital technology and platforms to ease the resolution of conflicts relating to environmental issues. These can be some of the application:

- **Online Platforms and Portals:**
  Establishing online platforms that allow parties involved to exchange messages, submit arguments and supporting documentation, and interact with mediators or arbitrators from a distance. For example, websites such as MODR.io or dedicated portals established by environmental groups.
- **Remote mediation and arbitration**:
  Using video conferencing software to conduct mediation or arbitration sessions online. This lowers travel expenses and carbon footprints by enabling participants to participate from diverse locations.
- **Data Visualisation and Analysis:**
  Making use of digital tools to visualize and analyze environmental data pertinent to conflicts. This can contain objective information in the form of environmental impact studies, GIS data, satellite photography, and other data to help settle conflicts.

[8] Indian Environmental Society (IES), New Delhi | India Science, Technology & Innovation - ISTI Portal; https://indiaenvironment.org/;

- **Blockchain:**

  Using blockchain technology to guarantee the immutability and transparency of documents pertaining to environmental challenges, such as land title, resource extraction permits, or regulatory compliance, is known as "blockchain for transparency."
- **Crowdsourcing and Citizen Engagement:**

  Including the public in the monitoring and reporting of environmental infractions and conflicts through digital platforms. This can provide local communities more authority to voice issues and take part in conflict resolution.
- **Digital Simulation and Modeling Tools:**

  Using digital simulation and modeling tools to evaluate different scenarios and forecast environmental effects can help with decision-making and conflict resolution tactics.
- **Education and Awareness:**

  To prevent conflicts and encourage early resolution, stakeholders will be informed about environmental laws, rights, and obligations through the development of digital educational tools and awareness campaigns.
- **Integrated Information Systems:**

  To enable thorough comprehension and settlement of intricate environmental conflicts, integrated information systems that incorporate environmental, legal, and socioeconomic data should be established.
- **IoT Devices and Remote Sensing Technologies:**

  Utilizing **IoT devices and remote sensing technologies** to monitor environmental conditions in real-time might yield objective data that is essential for settling disputes.
- **Mobile Applications[9]:**

  Developing mobile applications to report environmental problems, obtain legal information, or take part in community-driven dispute resolution procedures are examples of mobile application development.

[9] Centralised Public Grievance Redress and Monitoring System (CPGRAMS) is an online platform available to the citizens 24x7 to lodge their grievances to the public authorities on any subject related to service delivery. It is a single portal connected to all the Ministries/Departments of Government of India and States. https://pgportal.gov.in/

These examples show how digital technology can improve environmental dispute resolution's effectiveness, accessibility, and transparency—all of which can lead to improved environmental governance and sustainability outcomes.

V. ADVANTAGES AND CHALLENGES

ADVANTAGES

- **Effectiveness and Velocity[10]:** Digital procedures ensure a quicker settlement of environmental disputes by reducing administrative burdens and delays. Digital communication tools and automated workflows simplify case management and decision-making processes.
- **Availability:** Parties find it simpler to access the legal system with e-courts, particularly those who live in remote or underrepresented areas. The elimination of travel requirements through virtual hearings and online platforms lowers expenses and logistical obstacles.
- **Expense-effectiveness[11]:** E-courts provide a more economical method of resolving environmental issues because they require less physical infrastructure and incur less in travel and administrative expenses. Digital tools can help all parties engaged in a lawsuit reduce their costs.
- **Improved Display of Evidence:** The court's comprehension of intricate matters is enhanced by the more sophisticated presentation and analysis of environmental evidence made possible by digital tools. Clearer insights into environmental impacts and compliance can be obtained through interactive maps, simulations, and visual aids.
- **Sustainability:** Because they use less paper and emit less carbon dioxide during travel and in-person court operations, e-courts promote environmental sustainability.

[10] Connect2Court, The Digital Revolution in Legal Practice: A Guide to E-Filing, Connect2Court (Sep. 12, 2023)
[11] Connect2Court, The Digital Revolution in Legal Practice: A Guide to E-Filing, Connect2Court (Sep. 12, 2023), https://www.connect2court.com/post/a-guide-to-efiling.

CHALLENGES

- **Digital Divide:** Access to technology can be uneven, with some parties lacking the necessary digital literacy or resources to participate effectively in e-court processes. Courts need to ensure equitable access to digital tools and support for all parties.
- **Data Security and Privacy:** E-courts must put in place stringent data protection procedures and adhere to applicable privacy regulations. Managing sensitive environmental data and personal information necessitates strong cybersecurity measures to guard against breaches and unauthorized access.
- **Education and Developing Capabilities:** To utilize digital tools efficiently and comprehend the subtleties of digital evidence and environmental law, judges, attorneys, and court employees require training. Initiatives to increase capacity and provide ongoing instruction are necessary for e-courts to function effectively.
- **Legal and Administrative Adaptations:** It might be necessary to modify the legal system and court procedures in order to completely include digital technologies and allow for new techniques for managing cases and presenting evidence. It is imperative for policymakers and judicial authorities to collaborate in updating regulations to assure their continued support for the efficient operation of e-courts.

VI. TRANSFORMATION OF ECR[12] TO VECR[13]

Environmental conflict resolution (ECR) is a set of tools and processes used to prevent, manage, and resolve conflicts related to environmental quality or natural resource management. Nowadays due to the increase in environmental conflicts ECR is changing and adapting itself, as such to deal virtually and resolve cases without physical presence of affected parties on environmental issues, with the goal to achieve the best possible mutually beneficial outcome.

Outcomes of Transformation:

1. VECR as per data is more cost[14] effective, feasible, sound and more environment friendly.
2. VECR Increases accessibility and inclusivity.

[12] Environmental conflict resolution.
[13] Virtual environmental conflict resolution.
[14] Kenya Judiciary, *Virtual Hearings in the Environmental and Land Court*, (last visited June 16, 2024).

3. Wider Participation: VECR enables stakeholders from a variety of geographic locations, including remote and underserved areas, to participate in the dispute resolution process. This inclusivity ensures that all parties involved have a voice[15].
4. Reduced Barriers: Digital platforms can overcome physical disability barriers and provide accommodations for those who may struggle to attend in-person hearings.
5. Positive environmental impact.
    - Lower Carbon Footprint: VECR significantly reduces the need for travel, lowering the carbon emissions associated with transportation.
    - Paper Use Reduction[16]: Using digital documentation reduces the need for paper, which helps to conserve forests and reduce waste.

Skills required due to transformation:

To efficiently handle and solve environmental conflicts in a virtual environment, professionals must have a diverse set of skills that combine traditional conflict resolution expertise, technological proficiency, and environmental awareness. Here are the main skills needed for VECR:

- **Technical proficiency[17]:** Digital Literacy is the understanding and effective use of digital platforms and tools for communication, document sharing, and virtual meetings.
    1. **Experience with ODR Platforms:** Proficiency with specific online dispute resolution (ODR) platforms and software used for virtual mediation and arbitration.
    2. **Cybersecurity Awareness:** Understanding of fundamental cybersecurity practices for safeguarding sensitive data and ensuring the privacy and integrity of the dispute resolution process.
- **Environmental expertise[18]**
    1. **Environmental Law:** A thorough understanding of environmental regulations, policies, and legal frameworks relevant to the disputes under consideration.

[15] Amazon Conservation Team, *Using Online Platforms for Conflict Resolution*, https://www.amazonteam.org (last visited June 16, 2024).
[16] Supreme Court of India, *Annual Report 2021-2022*, at 45 (2022).
[17] Government of India, Ministry of Electronics and Information Technology, *National Digital Literacy Mission*, https://www.ndlm.in (last visited June 16, 2024).
[18] Ministry of Environment, Forest and Climate Change, Government of India, *Compendium of Environmental Laws in India*, at 23 (2018), https://www.moef.gov.in.

2. **Scientific Knowledge:** The ability to understand and interpret scientific data and reports about environmental impacts, ecological sustainability, and resource management.
3. **Sustainable Practices:** Understanding sustainable development principles and practices is necessary to ensure that resolutions are in line with environmental conservation goals.

- **Dispute Resolution Skills**
  1. **Mediation and Negotiation[19]:** Extensive experience facilitating negotiations and mediating between opposing parties to reach mutually acceptable solutions.
  2. **Arbitration:** Ability to conduct arbitration proceedings and make binding decisions based on presented evidence and legal principles.
  3. **Conflict Analysis:** The ability to identify the underlying causes and dynamics of environmental conflicts in order to develop effective resolution strategies.
- **Communication skills[20]**
  1. **Clear and Concise Communication:** The ability to communicate complex information clearly and concisely to a variety of audiences, including non-experts.
  2. **Active listening** requires strong listening skills in order to understand the perspectives and concerns of all parties involved.
  3. **Cross-Cultural Communication**: Understanding cultural differences and the ability to effectively communicate with stakeholders from various backgrounds.

Weaknesses of VECR:

While Virtual Environmental Conflict Resolution (VECR) has many benefits, it also has some potential flaws that may limit its effectiveness. Here are some of the main weaknesses:

1. **Technological barriers**
   - **Digital Divide:** Limited access to technology and the internet, particularly in rural or underdeveloped areas, can impede participation[21].

[19] Mediation and Conciliation Project Committee, Supreme Court of India, *Mediation Training Manual of India*, at 34 (2018), https://main.sci.gov.in.
[20] Indian Institute of Management, Ahmedabad, *Effective Communication Strategies for Managers*, at 56 (2017), https://www.iima.ac.in.
[21] Government of India, Ministry of Electronics and Information Technology, *Digital India Initiative*, https://www.digitalindia.gov.in (last visited June 16, 2024).

2. **Lack of Personal Interaction**[22]
    - **Reduced Personal Touch:** A lack of face-to-face interaction may reduce the effectiveness of communication and rapport-building.
3. **Security concerns**[23]
    - **Data Privacy:** Maintaining the confidentiality and security of sensitive information can be difficult.
    - **Cyber Threats:** Cyberattacks and unauthorized access can jeopardize process integrity.
4. **Lack of digital literacy**[24]
    - **Skill Gap:** Participants may lack the digital skills required to effectively engage in virtual dispute resolution.
    - **Training requirements:** Training stakeholders on how to use digital platforms may require a significant amount of time and resources.
5. **Legal and Regulatory Challenges**[25]
    - **Jurisdictional Issues**: Determining applicable law and jurisdiction can be difficult in a virtual environment.
    - **Decision Enforcement:** It can be difficult to ensure that virtual resolutions are enforced across multiple jurisdictions.

VII. WORKING OF JUDICIARY AND VIRTUAL ENVIRONMENT CONFLICT RESOLUTION.

The judiciary integrates VECR by leveraging digital technologies to resolve environmental disputes. Here is a detailed examination of how the judiciary works with VECR:

1. Adoption of Online Dispute Resolution (ODR) Platforms
    - Implementation of Digital Systems: Courts and tribunals use specialized ODR platforms for virtual hearings, mediation, and arbitration.

2. Training and Capacity Building
    - Judicial Training Programs: Judges and court staff are trained to use digital platforms and understand the nuances of VECR.

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[22] Kalyan Sankar, *Communication Skills in Virtual Environments*, at 56 (2021), https://www.books.google.co.in.
[23] Data Security Council of India, *Best Practices in Data Privacy*, at 34 (2020), https://www.dsci.in.
[24] Ministry of Skill Development and Entrepreneurship, *Skill Development Initiatives in India*, at 45 (2021), https://www.msde.gov.in.
[25] Supreme Court of India, *Annual Report on Legal Challenges in Virtual Dispute Resolution*, at 56 (2022), https://main.sci.gov.in

- Stakeholder Education: Litigants, lawyers, and environmental experts receive training on how to effectively participate in virtual proceedings.

3. Hybrid Hearing
    - Courts may hold hybrid hearings, where some participants attend in person and others participate virtually.
4. Use of Digital Evidence
    - Electronic Submission of Evidence: Secure online portals allow parties to submit digital evidence such as environmental impact reports, photographs, and videos.

PROMOTION OF VIRTUAL ENVIRONMENT CONFLICT RESOLUTION BY JUDICIARY

1. Policy Support and Directives
    - **Judicial Pronouncements:** Courts issue directives encouraging the use of VECR to ensure that environmental disputes are resolved quickly and efficiently.
    - **Incorporation in the Legal Framework:** VECR procedures are being integrated into environmental laws and regulations to formalize their use.
2. Public Awareness Campaigns[26]
    - **Raising Awareness:** Courts and tribunals raise awareness of VECR through public notices, media coverage, and outreach initiatives.
3. Collaboration with Technology Providers.
    - **Partnerships with Technology Companies:** Working with technology companies to create and maintain robust and user-friendly VECR platforms.

4. Supportive Infrastructure Development[27]
    - **Investing in Digital Infrastructure:** Governments and judicial bodies provide the necessary infrastructure to support VECR, such as high-speed internet and secure servers.

VIII. CASE LAWS:

[26] National Green Tribunal, "Public Awareness Campaign on VECR" (NGT 2021).
[27] Ministry of Communications and Information Technology, "Investment in Digital Infrastructure for VECR

- **Godavarman Thirumulkpad V. Union Of India, 1996**[28]

  This landmark case law, also known as the forest conservation case, involved the conservation and protection of forests across india.

  Here, The Indian Supreme Court evaluated the degree of deforestation and encroachment into forested regions using satellite imagery. This tool assisted in detecting illegal activities and tracking compliance to laws provided for the protection of forests.

  The court issued important orders to preserve and safeguard forest areas as a result of the use of satellite imagery, which offered an objective and precise image of the forest cover.

- **T.N. Godavarman Thirumulkpad V. Union Of India & Ors., 2014**[29]

  This case was a continuation of the Godavarman case that focused on the impact of mining activities in the forest.

  The court again relied on satellite imagery to know the extent of mining activities and it's impact on the forest.

  The supreme court imposed certain restrictions and orders to close down a few mining operations that could lead to further degradation of the environment.

- **Sterlite Industries (India) Ltd. V. Union Of India, 2013**[30]

  This case circled around the pollution caused by copper smelting plant in Tamil Nadu. In this case digital evidences were used in the case, such as reports from monitoring agencies and online submissions of pollution data. These digital data were used by the Supreme Court and the National Green Tribunal (NGT) to assess the environmental infractions and mandate the plant's shutdown until compliance was guaranteed.

- **Vellore Citizens Welfare Forum V. Union Of India, 1996**[31]

  This case revolved around pollution by tanneries in Tamil Nadu.

  The case established a precedent for the use of digital submissions and online platforms for monitoring compliance to environmental standards. The Supreme Court ordered

[28] Godavarman Thirumulkpad V. Union Of India, 1996 W.P. (Civil) No. 171/96
[29] T.N. Godavarman Thirumulkpad V. Union Of India & Ors., 2014 W.P. (Civil) No. 202/1995
[30] Sterlite Industries (India) Ltd. V. Union Of India, 2013(Civil Appeal Nos. 2776-2783 of 2013)
[31] Vellore Citizens Welfare Forum V. Union Of India, 1996 5 SCC 647

that information on pollution levels and compliance status be published on the website of the pollution control board.

- **Ganga Pollution Case (M. C. Mehta and Anr. V. Union Of India & Ors., 1987[32])**

  This case addressed the severe pollution in the Ganga River caused by disposal of sewage, industry, and other pollutants, endangering public health and the environment. The supreme court highly relied on satellite imagery and remote sensing data to monitor pollution levels and assess the impact of various activities on the river.

  Installation of online monitoring equipment was mandated for industrial units in order to provide real-time data on effluent discharge. These methods assist regulatory bodies with tracking compliance to pollution control norms.

  Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) were instructed to publish pollution data compliance status of industrial units on their official websites so that transparency is ensured and it also allowed public access to critical environmental information.

  The court emphasized the need for web-based reporting mechanisms for industries to submit compliance reports online, as it reduces delays and enhances accountability.

  In order to gather real-time-data on water quality in several locations along the Ganga River, the court ordered the installation of sensors and automated systems, so that prompt actions and timely interventions can be made to take pollution control measures.

XI. CONCLUSION

"The environment is where we all meet; where we all have a mutual interest; it is the one thing all of us share."[33]

The primary goal of environmental law is multifaceted, aiming not only to protect and preserve the environment, but also to ensure its sustainable use and maintenance in the best possible condition. In order to achieve this goal, nations around the world have signed numerous treaties, conventions, and agreements. These international instruments help to harmonize efforts and establish standards for environmental protection across borders, addressing issues like pollution control, biodiversity conservation, and sustainable resource management.

[32] M. C. Mehta V. Union Of India,1987 SCR (1) 819; AIR 1987 965

[33] Lady Bird Johnson, Environmentalist, Speech at the National Parks Conference (May 8, 1965).

There is a growing recognition that future conflicts may arise over critical resources such as water and clean air. It is frequently speculated that future wars, dubbed the "fourth world war," may revolve around securing access to these critical resources. To avoid such conflicts and ensure global environmental sustainability, it is critical to find peaceful solutions. These solutions must include international collaboration, cutting-edge technologies, and effective policy frameworks that address the equitable distribution and conservation of clean air, water, and other vital natural resources.

Humanity's scientific advancements have historically harmed the environment. However, technological advancements now offer opportunities to protect the environment. Virtualizing the dispute resolution process can significantly reduce energy consumption and the carbon footprint.

If the global community chooses online dispute resolution (ODR), it accepts the responsibility of significantly increasing technical awareness and support among officials involved. This includes providing comprehensive training programs that equip them with the skills required to effectively navigate and use ODR platforms. Furthermore, increased measurement and systematic research are critical for refining and optimizing the use of ODR in various contexts. These efforts are critical not only for increasing efficiency, but also for alleviating any concerns or resistance among government officials to the widespread adoption of ODR. Education and training initiatives are critical in building confidence and competence in ODR methodologies. On a case-by-case basis, mediators and arbitrators are chosen based on their expertise and cultural sensitivity, ensuring that they can effectively handle diverse disputes. Internal policy directives and performance goals can help to institutionalize the use of ODR within government bodies by establishing clear expectations and benchmarks for its implementation.

Furthermore, initial investment in ODR programs and personnel is critical for developing a strong infrastructure and support systems. This includes creating user-friendly interfaces, protecting data, and providing ongoing technical support to users. By prioritizing these fundamental elements, governments can create an enabling environment that encourages widespread adoption of ODR as a dependable and efficient alternative to traditional dispute resolution methods[34]

[34] Joseph A. Siegel, 'Alternative Dispute Resolution in Environmental Enforcement Cases: A Call for Enhanced Assessment and Greater Use', 24 Pace Envtl. L. Rev. 187 (2007)

Article No. 2.

LEGAL PRACTICE: TECHNOLOGICAL TRENDS SHAPING THE FUTURE FOR NEW LAWYERS

ABSTRACT

The legal profession is undergoing significant transformation due to rapid technological advancements, presenting both opportunities and challenges for budding lawyers.

Artificial Intelligence (AI) and machine learning are revolutionizing legal research and case analysis. AI-powered tools can quickly sift through vast amounts of legal data, offering relevant case law and legal precedents with unprecedented speed and accuracy. For young lawyers, mastering these tools can enhance efficiency and provide a competitive edge.

Blockchain technology is emerging as a transformative force in areas such as smart contracts and secure, transparent transactions. Understanding blockchain can help budding lawyers navigate and innovate within fields like intellectual property, real estate, and financial law, where secure and verifiable transactions are crucial.

Familiarity with these platforms is becoming essential for modern legal practice, enabling lawyers to manage their caseloads more effectively and provide better client services.

The rise of cybersecurity concerns necessitates that new lawyer be adept at identifying and mitigating risks associated with digital data. Knowledge of cybersecurity laws and best practices is increasingly important, as law firms handle sensitive client information that must be protected from breaches and cyber-attacks.

Virtual law practices and remote work have become more prevalent, accelerated by the COVID-19 pandemic. Budding lawyers must be proficient in digital communication tools and virtual collaboration platforms to thrive in this new working environment.

In conclusion, technological advancements are not merely supplementary but central to the modern legal profession. Budding lawyers who embrace these trends and develop their technological skills will be well-positioned to succeed and lead in an evolving legal landscape. Continuous learning and adaptation are key, ensuring that they remain at the forefront of legal innovation and service delivery.

Introduction

1.1: Overview of technological transformation in the legal profession –

The law field has been heavily influenced by technology in the past few years. Lawyers now use the Digital Tools like document management, communication, cloud-based tools and also some research tools. Also, lawyers use social media platforms to build a professional network for marketing themselves and to stay informed about the legal development.[35]

Technology like Data Base and A.I. helps to review document and predict case outcomes with the increased reliance on technology, cyber security has become more critical. Law firm need robust security measures to protect sensitive client data.

1.2: Opportunities and challenges for budding lawyers –

There are many opportunities for budding lawyers if they have some technological skills like Document management, cloud computing, legal analytics, automations, A.I., Cybersecurity, Remote collaboration and social media handling.

Also, the budding lawyers have to face some major challenges like High competition, experience gap, uneven salaries, High stress, lack of practical skills, etc.

1.3: Importance of technological proficiency –

The technological proficiency has enhanced efficiency and productivity. Technology automates repetitive task like document review legal research and due diligence, freeing up lawyer's time to focus on complex legal issue and client strategy.

This has also improved the collaboration with the help of cloud-based tools and document management. Communication tools like email, instant messaging and video conference allows for real time communication with clients and colleagues regardless for locations.

1.4: Research Methodology –

In this research paper doctrinal analysis method is followed throughout the paper. The study is based on secondary data only. Secondary data or the sources being articles, blogs, websites, journals have been used to refer for the formation of this paper. All these data have been used to understand that is the technological trend helpful for lawyers and how it is beneficial. These data or sources has helped the paper in understanding the current scenario in the society with respect to

[35]Legal technology's authoritative guide, Chris O'Leary https://legal.thomsonreuters.com/blog/technology-in-law-is-the-new-norm/

the research topic and helped in, in depth study for this research paper. This study is basically more of existing scenarios and the laws made hence no field study has been done.

Artificial Intelligence and Machine Learning

2.1: Role of AI in legal research and case analysis –

Lawyer should be aware about technologies cause in some area and also in some Law firms they have already started using A.I. and which is helping them to complete their task quickly and also A.I. will take over (or at least affect) the significant amount of work done by lawyers.[36]

Statements of some authors: -

- Lauri Donahue: - She is the Director of the Harward Journal of law. She said, "A.I. is being used to review document during litigation & due diligence, analyse contracts, perform legal research and predict case outcomes."
- Lindberg: - He said that, "Westlaw is very different than some of the freely available tools, like ChatGPT, these tools are looking to create a chat like experience that can be great for creative writing. But with legal research, you need accuracy reliability and responses that are fully grounded in trusted primary law."

LEGAL RESEARCH –

Using A.I. is now the most common way used by new generation lawyers for any legal research. The new A.I. tools are very familiar to use like ChatGPT or Gemini, which has fastened the speed of work and these technology helps attorneys to find any important information quickly, otherwise it would have taken hours if it is done manually. In earlier stages, when A.I. was discovered some of the authors said that it is useless to use A.I. for legal research cause at that time A.I. doesn't give the correct and point to point information. But, now A.I. got upgraded much better and now many lawyers and also many of the law firms are using A.I...

CASE ANALYSIS –

Case analysis is very crucial thing to make decisions, for problem solving, strategic discussion. It is a time-consuming process and also human make some error while analysing the case. But A.I. has revolutionized this process, A.I. summarises the lengthy data within some seconds and the

[36] What is A.I. and how can Lawyer use it, **https://www.clio.com/resources/ai-for-lawyers/lawyer-ai/**

lawyers to save their time. Also, A.I. don't make any error as humans, it gives the analysis very accurately.

2.2: Benefits of AI-powered tools for young lawyers –

For budding lawyers A.I. is the most powerful and very easiest thing which give them multiple benefits like A.I. helps young lawyer to save their time for lengthy task, also it helps them to learn faster and also it helps them to impress clients, some benefits are-

- **Enhance learning**: - A.I. helps to analyse any case in very short time and also A.I. provide relevant case laws, statues, and give us the summery of that vast case.
- **Decision making**: - A.I. analyse the case and predict the case outcome, which help younger lawyer to make decisions and also it helps to boast their confidence.
- **Improvement of skills**: - A.I. helps to make bridge in between the experienced lawyer and the young lawyer by automating the tasks, also it helps to give the solution of complex cases. It gives the valuable experience that would normally take years.

Blockchain Technology

Legal services are built on trust, security and well-documented systems. Blockchain technology, with its principles of decentralized governance, immutability and transparency, offers an interesting opportunity to change the legal system. We also explore the challenges and perspectives for adopting blockchain in the legal sector.

3.1: Introduction to blockchain and its applications

In 2008, a person using the pseudonym Satoshi Nakamoto first described Blockchain in a paper published online. Ideas from Nakamoto's book were implemented to create Bitcoin, a unique form of unbroken digital currency. Bitcoin is the first product of the Blockchain system. Simply put, a blockchain is a chain of blocks that contain information. Imagine you own a grocery store. As the owner, you have a ledger that contains all the products you bought or sold, and who you bought them from and who you sold them to. Blockchain is like a ledger and every record is a block.

There are three types of messages in each block. First, important information, if we take Bitcoin as an example, the data related to it are transactions, public addresses, etc. Secondly, based on the information stored in the block, a unique code, i.e. hash, is created. The hash of the previous block

is stored in the hash of the next block, and so on. Blockchain security comes with new hashing and proof of work or proof of stake methods.

3.2: Impact on Specific Legal Fields

Blockchain will help to make approximately every task easy and help lawyer in every way they want. Impact of Blockchain in Legal fields are:

- **Monetary Transaction:** Blockchain will accept all the crypto currency payments in some specific areas like criminal cases and family cases.
- **Identification Verification:** Blockchain will help to identify the identity without revealing any sensitive data.
- **Notary service:** Notary service plays the important part in court procedure to keep the certification on record. In this area Blockchain will help to provide proof of existence, proof of ownership, and transferring document ownership.

Cases and Examples in Action

- **Kimberley Process Certification Scheme:** The Kimberley Process aims to prevent the trade in "conflict diamonds" – diamonds mined in areas controlled by rebel groups and used to finance wars. The organization is exploring the use of blockchain to track diamonds throughout the supply chain, ensuring their ethical origin and preventing the trade in conflict diamonds.
- **Estonia's E-Residency Program:** Estonia, a leader in e-government initiatives, uses blockchain technology to secure its e-residency program. This program allows individuals to apply for and manage their residency status online, with all documents and records stored securely on a blockchain.

3.3: Fields benefiting from blockchain: intellectual property, real estate & smart contract

- **Smart Contracts:** Smart contracts[37] are the blockchain version of traditional contracts. Smart contracts are used to activate when certain conditions are met. Smart contracts

[37] Blockchain application in legal field, https://speedlegal.io/post/blockchain-applications-in-the-legal-field

eliminate the need for many central services, including brokers and agents, for contract execution. Modern contracts are independent, decentralized and automated. When an initiator initiates a smart contract, it happens automatically. Distributed because it lives on millions of computers in the blockchain. The smart contract must execute the terms of the contract directly according to its own program, including the distribution or collection of funds. Trust is one of the problems that smart contracts overcome. If the agreed thing is not done, then the law does not support the agreed amount of money. Although it seems that smart contracts will replace lawyers in the near future, this is not possible in the near future. First, smart contracts are not contracts. In the real world, things often go wrong. A smart contract team can steal a warehouse full of cotton or a ship that can sink in the Bermuda Triangle. Such unexpected mistakes require an independent person who can make the right call for both parties.

- **Intellectual Property Rights**[38]**:** Blockchain can be used as an IP ledger where owners can store digital certificates of their IPs and collect taxes from people who want to use their art or creations using smart contracts. Registering and granting patents is tedious and time consuming. The approval time by relevant authorities and other relevant authorities is slow. By implementing a modern system with a decentralized system, the process of registration and transfer of ownership becomes smooth and hassle-free. Authors can obtain proof of ownership using Blockchain. Registration of any work on the site provides the owner with a certificate of ownership.

- **Real Estate:** Blockchain help to manage property, secure payment, financing, leasing, and also help for the purchase. Some opportunities given by blockchain technology are:
  - Improve the process of property search
  - Helps for smarter decision making
  - It gives the cheaper property title management service

[38]10 ways Blockchain technology will change the legal industry, Jaliz Maldonado, https://natlawreview.com/article/10-ways-blockchain-technology-will-change-legal-industry

Legal Tech Startups

4.1: Rise and proliferation of legal tech startups –

Technology and innovations have changed the look of many top professions including 'law'. The 21st century is said to be the era of rapid global technological development, Legal technologies have made the work easier for all the lawyers. Legal technology is the use of software and the internet to provide legal services. The technology and the software will also help aspiring lawyer to do all the stuffs without depending on senior lawyer or someone else. The technology helps all the aspiring lawyer to grow in their life faster as compare to the earlier period and with the help of technology and skills they can earn way much better.

After the pandemic of covid 19 the use of technology has increased and around 52% of the law firms indicates that they will work from in future. And also, in present time the use of e-signature has increased by 63%. And 62% of legal professional says that they will increase the use of technology for remote collaboration, for contract, for signatures and also for the research work. In 2018 55% of the law firms are tech based, which increased by 3% and in 2019 the percentage of tech law firms are around 58% and also the report says that this will increase rapidly with the ratio of 3% till 2030 and this will go on increasing.[39]

4.2: **Innovative solutions for case management, document automation, and client communication –**

With the use of technologies, it become very easy to handle all these stuffs like case management, document automation, and client communication & also technology gives us new and innovative solution to handle all these stuffs.

- Case management – In legal firms now a days they use software to make their work easy and some innovative solution for case management are Blockchain, Voice-assistant, etc. Blockchain will save all your files secure and it will accessible to only the authorized users. And with the help of crystal-clear communication software, all the individuals who are involved in the case will be able to see the latest update in the case and this will increase the trust of client. Also, there is one more software called auto pilot which will remind you

[39] Legal Tech Startups: Driving Innovation in the Legal Industry, https://www.law.com/topics/legal-technology/

about the case and also, they can keep your cases moving by automatically triggering tasks when things happen.

- Document automation – It is a very time taking process but technology made it very easy. A.I. help to take interview of clients, and gather all the information with accuracy. Also, it analyses that all the documents are accurate and also A.I. doesn't make mistake like humans. A.I. reads all our draft and highlights the issues and correct it. There is many software for Natural Language Processing which analyse the case and gives us the relevant case law, statues and also some targeted legal research which support our arguments. Also, Natural Language Processing identify potential risk and weaknesses in our legal drafts.

4.3: Importance of familiarity with legal tech platforms –

Legal tech platform boost efficiency, cut costs, and lead to better client results. Legal tech platforms come jam-packed with perks.

Why Legal Tech Platforms is important

- Getting things done faster: Legal tech makes routine tasks a breeze. This frees up time for lawyers to tackle more complex jobs. From managing documents to working on cases, tech tools make teamwork seamless.
- Cutting Costs: By ditching manual work and admin hassles, legal tech can save law firms serious dough. Cloud solutions mean no pricey hardware bills or upkeep costs. That makes top-notch tech available to all kinds of firms.
- Serving Clients Better**:** Thanks to legal tech, lawyers can give clients top-notch, tailored service. This boosts satisfaction and loyalty. Client portals and communication tools make updates easy to access. That builds trust and openness.
- Keeping Data Safe: Legal tech has tight security features that keep sensitive data safe and follow rules. With encryption, safe file sharing, and audit trails, confidentiality stays rock solid.

How Training and Know-How Matter[40]

Legal tech rocks many benefits, but success hinges on how well lawyers know their way around it. Training and being familiar with the tech play a big part in getting all its advantages:

- Training Programs Matter**:** Give lawyers and staff a crash course in how legal tech tools tick with solid training programs. Ongoing sessions and support keep folks sharp on new legal tech trends.
- Getting Users on Board**:** A big part of using legal tech right is making sure everyone dives in headfirst. Encourage users by offering perks, asking for feedback, and solving issues fast. That makes sure everyone's comfy using the latest legal gadgets.

- Tailoring Tools Just Right: Customizing legal apps to match what suits your practice best boosts ease of use and cuts down time-wasting moves. Integrating them with what you already use—like CRM software or billing tools—makes everything move like clockwork.

Cybersecurity Concerns

The Lawful Segment handles delicate client information on a day by day premise, and numerous have an universal reach. This makes them a hot target for programmers and malevolent insiders as well as being bound by more than likely numerous compliance requirements. In the final few a long time a quarter of law firms have detailed being a casualty of a cyber-attack of a few sort, and that is as it were anticipated to rise! With cybercrime dangers ceaselessly advancing, as hoodlums discover modern ways of beating security program and deceiving individuals into clicking on joins and opening pernicious records, it makes sense to take steps to be ahead of the diversion**.**

5.1: Increasing importance of cybersecurity in legal practice[41]

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[40]American Bar Association article "Tech Training for Lawyers: 6 Must-Have Tips", https://www.americanbar.org/groups/law_practice/resources/legal-technology-resource-center/

- [41]**:The increasing in importance of cyber security,** https://www.lawcrossing.com/article/900054462/The-Increasing-Importance-of-Cybersecurity-in-Legal-Practice/

- **Growing Concern:** Cyber threats to law authorization are expanding, making them a prime target for hoodlums. Cybercriminals recognize the esteem of delicate data held by law firms, counting client data, monetary data, and secret data. Ransomware assaults have ended up a danger, with programmers scrambling information and requesting deliver to discharge it. Phishing tricks disguise as authentic emails or records and are planned to trap attorneys and workers into uncovering delicate data or introducing malware.
- **New Trend:** In an ever-changing cybersecurity environment, legal professionals must keep up with new business trends and emerging threats. Understanding these trends can help law firms improve their cybersecurity strategies and effectively mitigate risks. Legal entities should carefully review the security measures employed by Cloud providers and ensure compliance with data protection laws. group Another trend is the rise of mobile devices and telecommuting in law firms. Mobile devices that require strong encryption and internal access policies can be lost, stolen or accessed without authorization.
- **Security of client Data:** Cybersecurity is important for lawyers and law firms because it plays a key role in protecting sensitive client information and preserving the integrity of the law. One of the key reasons for the importance of cybersecurity in law is the responsibility to protect client confidentiality. Lawyers have a legal and ethical duty to protect the privacy and confidentiality of their clients. A cybersecurity breach could result in unauthorized access to confidential information, which could lead to a breach of attorney-client privilege and possible criminal liability. Lawyers can fulfill their responsibilities to protect client information and maintain client trust and confidence by implementing strong cybersecurity measures.

5.2: Identifying and mitigating digital data risks

As cyber threats become more sophisticated and the impact of data breaches deeper, law firms must prioritize the protection of sensitive information. Regulatory compliance, maintaining customer trust, mitigating cyber risks, complying with regulatory obligations, and choosing the right conduct management software provider are key areas. When choosing a practice management software provider, it is important to consider their commitment to database security. ISO 27001 is a recognized international standard for information security management systems. It provides a framework for identifying, managing and mitigating information security risks. By working with ISO27001 certified service providers, law firms

can guarantee that they will maintain the highest data security and information security standards.

- **Cyber security Framework:** With so many options, it can be difficult to choose the right type of cybersecurity for your business. Risk assessment tools such as the National Institute of Standards and Technology's (NIST) Risk Management Framework are a good place to start because they provide the best methods for combating cyber threats. With these tools at your disposal, you can find effective ways to protect your business from data breaches and other cyber threats.
- **Evolving Threats:** Law firms must keep pace with evolving cybersecurity challenges. In our opinion, you don't need to throw money at the problem to make it go away. You don't need to spend millions installing a large SIEM solution that you may not use. Knowing where your sensitive data is, who has access to it, and what users are doing with it is essential to protecting your business and organization from cybercriminals. These things should be a priority for law firms who are among the most sought after by cyber criminals.

5.3: Cybersecurity laws and best practices for new lawyers

Information security law is an emerging area of law that focuses on one valuable resource of our society: information. Data Protection Law is nothing new. However, information security law is "emerging" in the sense that it has been developing for the past two decades, unlike many areas of traditional law, such as real estate, which have been with us for a long time. This arose because the development of law increased to Information Security Act or Infosec Act is partly a new piece of legislation. In other words, it's a new practice area for law firms and one that has one firm focus. This article deals with all aspects of information security laws. Information security, as an emerging legal field, encompasses many areas. Basically, information security lawyers advise their clients on the requirements for data security and information systems.[42]

- **Privacy vs. data security:** These two terms are often confused—perhaps because many law firms lump the term into one practice area. And while some lawyers practice in both areas, others are responsible for one or the other. Data security or cyber security focuses

[42] Federal security and data privacy law security, https://www.itgovernanceusa.com/federal-cybersecurity-and-privacy-laws

on protecting computer systems from unauthorized access. Cybersecurity lawyers advise clients on the best ways to protect personal identity, privacy, personal information and other sensitive information, including developing appropriate internal policies and training programs. Cybersecurity lawyers can also guide clients through a data breach, work with IT audit teams and determine the legal obligations and liabilities that may arise from a data breach. Instead, privacy lawyers focus on advising clients on laws that may limit or restrict the collection and use of personal information, such as the European Union's General Data Protection Regulation, he California Consumer Privacy Act and other laws recently introduced in China, Colorado.

- EU-US Privacy Shield: Privacy Shield was created to protect the data of EU residents that is owned and processed by US parties. The protection of personal data in the United States is nowhere near what the EU considers adequate. The European Court of Justice (EC) declared the EU-US privacy shield invalid on July 16, 2020, following the Schrems II decision. Because large amounts of data are exchanged between the US and the EU, the US government and EU companies have developed a program called Safe Harbor to circumvent previous data protection directives., The European Court of Justice (EC) invalidated the Safe Harbor agreement on October 6, 2015, prompting the EU Commission and the US government to quickly create an alternative system that is compatible with the EU's General Data Protection Regulation. General Data Protection Regulation (GDPR). EU-US Privacy Shield Agreement: To certify itself to the Privacy Shield, a company must: Many companies outside the financial sector Create a Privacy Shield compliance statement and ensure that your organization's data protection policy meets the Privacy Shield standards Ensure that your organization has a Shield compliance monitoring system.

- Consumer Privacy Protection Act 2017: The Consumer Privacy Act of 2017 seeks to ensure the privacy and security of sensitive personal information, prevent and reduce identity theft, report security incidents involving sensitive personal information, and enhance law enforcement and other protections against it, breach of security, fraudulent acquisition and misuse of personal data. It applies to entities that collect, use, acquire, transmit, store or dispose of the personal information of 10,000 or more US citizens in a 12-month period.

- **Electronic Communications Privacy Act and Stored Communications act:** The Electronic Communications Privacy Act (ECPA) was passed in 1986 to expand and reform federal telephone and electronic interception. ECPA amended the Wiretap Act, enacted the Secured Communications Act and the Criminal Records Act. The Wiretap Act applies to the interception of electronic and wire communications, including "the transmission of sound in whole or in part by telephone transmission, wire, cable, or similar connection." Verbal communication is "any verbal communication in which a person expresses an expectation that the communication does not use a situation that supports that expectation"; This means any face-to-face conversation where a third party is assumed not to be listening. People who violate the ECPA will be imprisoned for five years and fined up to $250,000. The United States itself cannot be sued under the ECPA, but evidence collected illegally cannot be brought into court.

Virtual Law Practices and Remote Work

Virtual law practices and remote work have become more popular in legal field. With the help of technologies and A.I. lawyer can work remotely and provide services to the clients in anywhere in the world.

6.1: Shift toward virtual law practices

There are many changes happening in law field and many lawyers are moving toward technological advancement and also started virtual law practices. The shift was happening because of advancement in technology, change in work culture, and majorly after the covid 19 pandemic.

- **Benefits of virtual law practices:** Virtual law practice does not require any office space so it will save your cost. It will increase the flexibility of work because it will help you to work virtually. With the help of virtual work lawyer can provide their services to their client internationally.
- **Challenges for virtual law practices:** There are many challenges which have to be faced by lawyer like technological advancement and client trust building virtually or you can say remotely, Communication issues, lawyers need be more aware if he is talking to his client

or colleague cause remote meetings causes much miss understanding so lawyers need to talk clearly in virtual mode.

- **Successful Virtual law practice:** To become successful in virtual law practice lawyers need to invest in some technologies which will support their virtual law practice. They have to set up balance in their professional and personal life for a healthy work life. The main and the important thing is to manage your time and to be in a organize way so that you will be punctual and give your time to your clients which help to build trust.

6.2: Impact of the COVID-19 pandemic on remote work

The Covid-19 pandemic has significantly impacted how people work, leading to extensive use of remote work options and digital tools in various professions, including the legal sector. This shift has transformed the traditional image of lawyers surrounded by paper stacks and physical libraries, as digital tools now enable legal work to be conducted through laptops. Legislative reforms during the pandemic have further facilitated the increased use of digital tools and services. This article examines how several countries adapted their legislative frameworks to support remote work and the lasting impact of these changes on the legal profession.

Legal frameworks in different countries after Covid-19 pandemic[43] –

- **Australia:** Australia's legal framework for remote work has been in place since 2009 when the National Employment Standard (NES) – Fair Work Act was adopted. This standard allows employees to request flexible working arrangements, although it does not guarantee their implementation. In August 2021, the Fair Work Ombudsman issued a 'Flexible working arrangements Best Practice Guide' to promote the benefits of flexible working, including improved job satisfaction, reduced stress, and increased productivity. The Law Council of Australia and other legal organizations have also advocated for flexible working arrangements, providing their own guidelines for the legal profession.

- [43] **The Pandemic's Impact on Legal Work: A Comparative Analysis of Legal Frameworks, Practical Impacts and Innovation, Elisa Henry and Marguerite,** https://www.ibanet.org/bli-may-2023-pandemic-impact-on-legal-work

- **Belgium:** Belgium has established two types of remote work: 'structural telework' and 'occasional telework'. Occasional telework can be requested for force majeure or personal reasons. During the pandemic, exceptional rules mandated telework. Structural telework is voluntary and involves consistent remote work. Attorneys' ability to benefit from these options depends on their classification as employees. Attorneys in Belgium are generally considered independent enterprises and can determine their own working conditions. The pandemic has led to a culture shift in remote work. The Belgian government made remote work mandatory in response to the pandemic, with exceptions for essential professions, including the activities of attorneys.

- **India:** India's legal framework currently lacks specific legislation on remote work, except in cases such as after maternity leave and for establishments in Special Economic Zones. The country is in the process of codifying its Industrial Relations Code 2020, with the draft model standing orders for the services sector including a reference to 'work-from-home'. Despite the absence of specific legislation, the legal profession in India has been actively engaging in remote work based on internal firm or company policies.

Conclusion

The integration of AI in legal technologies is already underway. Legal professionals need to understand how AI can enhance their work while upholding their duty of technical competency. As AI becomes more prevalent in legal processes, it raises new concerns about privacy, accountability, and decision-making. Lawyers who are well-informed about these issues will be better equipped to navigate an AI-integrated legal system. It is essential to stay informed, exercise caution, and share knowledge with the community to build a strong foundation for the future of AI in law.

Blockchain technology is still in its early stages of development, but its potential to transform the legal landscape is undeniable. By promoting transparency, security, and efficiency, blockchain can revolutionize legal processes, improve access to justice, and empower individuals and businesses to navigate the legal system with greater confidence. As the technology matures and legal

frameworks adapt, we can expect even broader and more innovative applications of blockchain in the legal sphere.

Getting comfy with legal tech tools is a must for modern lawyering superstars who want to wow clients and stay ahead of the curve! Dive into the digital age with open arms by embracing technology, getting savvy on training tricks, and thinking like a true techie lawyer.

"Legal smarts will shine bright in this digital tomorrow!"

Cyberspace offers great benefits and opportunities, as well as great threats and risks. risks and threats is an essential aspect of cyber security. The idea that cybersecurity can have a great goal, that is comprehensive and high-level can seem desirable: an irrational and other-worldly response to the fact that there can be great problems from the Internet. However, the threat / continuous response, although difficult, is really not only about cybersecurity: it is possible for cybersecurity to have a greater purpose than the pursuit (security) infinite value. If cyberspace is valued as much as it is feared, then the broader goal of cyber security may not only be to eliminate threats as they arise, but also to create positive opportunities for change. Cybersecurity will also consider the processes of the rapidly changing digital environment and benefits (such as safety, security and governance) at every level and where human activity takes place.

Hence, the technological trend in the legal field is making a drastic change with the help of A.I. and this technological trend is making the life of lawyer easy and also help the lawyer to save time, cost and help to build trust in clients and also lawyer can work from any part of the world and also can meet anyone remotely or virtually. So, this trend is very useful and reports are saying that the trend will go rapidly till 2030.

Article- 3

Guarding Women's Safety: Navigating the Threat of Deepfakes

By Anvesha Chaturvedi[44]

ABSTRACT

"Privacy is not something that I'm merely entitled to, it's an absolute prerequisite."

- Marlon Brando

"In the digital age, the emergence of deepfake technology poses a profound threat to the safety and privacy of women worldwide. Deepfakes, synthetic media created using advanced artificial intelligence algorithms, have the potential to manipulate and distort reality with unprecedented realism, often with malicious intent. One saying goes, "A camera cannot lie." However, "deep fake" technology has allowed for an exponential increase in the ability to distort reality. This feature enables the creation of audio and video featuring actual individuals saying and acting in ways they have never uttered or done. These manipulations are common in politics and, more recently, the pornographic industry, where women's faces have been imposed on other people's bodies to generate deceptive video images that can lead to non-consensual sexual image abuse and other negative effects. This trend may significantly aggravate the societal obstacles that women already face, which may affect their personal safety, work, education, and mental health. Hence, this paper explores the multifaceted impact of deepfakes on women's safety and privacy, delving into psychological, social, and legal dimensions while proposing strategies for mitigation and prevention. It then proposes comprehensive techniques for reducing deepfake dangers. Alongside regulatory and legal measures including legislative initiatives and collaboration with tech companies and platforms.

This paper is a call to action for protecting women's safety from deepfake threats as we go through the ever-evolving world of digital deceit, making sure that the promise of technology never comes at the expense of women's security and dignity."

KEYWORDS: Cyberbullying, Deepfakes, Privacy, Legal implications, Women.

INTRODUCTION:

[44] X Semester, B.Com.LL.B.(Hons.), Dr. Shakuntala Misra National Rehabilitation University, Lucknow.

Deepfake technology poses an unprecedented danger to the fundamentals of personal privacy at a time when reality can easily blend into fiction at the click of a button. The world has seen a Bollywood star in skin-tight lycra, a Bangladeshi politician filmed in a bikini and a young Pakistani woman snapped with a man, though none of the three images were actual, their plausibility was sufficient to incite hatred, lust, and even a possible murder.[45] This highlights the dangers that generative artificial intelligence poses to women. For years, women have already faced sexual harassment online and with the rise of artificial intelligence, it is only getting worse. In India alone, according to the NCRB's 2021 report, out of the 2597 recorded cases of women-centric crimes, 1896 cases were related to distributing or transmitting sexual content, and 701 cases involved instances of other women-centric offences, such as fake avatars, blackmailing, morphing, and so on.[46] According to the NCW Chairperson, 98% of cybercrimes are carried out against women.[47] This shows how the promise of technology comes at the expense of women's security and dignity.

As the world is evolving so is the technology, one such thing is AI i.e., Artificial Intelligence which has the simulation of human intelligence processed by computers. Deepfake is also a kind of AI used to create convincing images, audio, and video hoaxes.[48] To put it simply, deepfakes are any type of person's films, audios, or photographs that have been manipulated to make them look to be of someone else. The easiest technique for producing a deep fake is face-swapping, which is the process of digitally stitching one's face to another person's body. Although the political deep fakes are a new concern but, the majority of the time, they transpose famous women's faces into a pornographic context. This is because, the Celebrities, especially women, who are subject to such malicious acts, they are an easy target and their objectionable videos are the most marketable commodity.[49] In addition to raising concerns about freedom of expression, deep fakes also call

[45] Rina Chandran, Thomson Reuters Foundation, Flood of AI and deepfake images underline threat to women, sexual minorities in South Asia, Scroll.in < https://scroll.in/article/1060585/flood-of-ai-and-deepfake-images-underline-threat-to-women-sexual-minorities-in-south-asia> last visited at 24/05/2024.
[46] Ranjan, Radha. (2023). CYBER CRIMES AGAINST WOMEN IN INDIA FROM COVID TO THE PRESENT ERA. < https://www.researchgate.net/publication/378679509_CYBER_CRIMES_AGAINST_WOMEN_IN_INDIA_FROM_COVID_TO_THE_PRESENT_ERA/citation/download> last visited at 24/05/2024.
[47] *Ibid.*
[48] Nick Barney, 'What is deepfake AI?' (TechTarget) < https://www.techtarget.com/whatis/definition/deepfake> last visited 24/05/2024
[49] Vikrant Rana, Anuradha Gandhi And Rachita Thakur, Deepfakes and Breach of Personal Data- A bigger picture, Live Law Available at, <Deepfakes, Personal Data, Artificial Intelligence, Machine Learning, Ministry of Electronics and Information Technology, Information Technology Act (livelaw.in)> (last visited on 19 May 2024, 10:41 A.M.)

into question people's sovereignty over their privacy and reputation. Just banning this technology or any AI-based technology is not an appropriate and remedial measure against increasing cases of cyber-crimes against women on the internet. As a result, for digital governance, periodic assessment is required to maintain accountability in cyberspace.

WHAT IS DEEPFAKE?

Deepfake technology, driven by advancements in artificial intelligence, profound learning techniques, has become a potent tool for creating highly realistic fake videos, images, and audio recordings. Leveraging vast datasets of digital media content, deepfake algorithms are trained to synthesize facial expressions, gestures, and voice patterns, producing content that is often indistinguishable from genuine material. This process typically involves the use of generative adversarial networks (GANs), where a generator network produces fake content while a discriminator network tries to distinguish between real and fake data. Face swapping, a prevalent deepfake technique, entails replacing the faces of individuals in videos or images, requiring extensive training data for both the source and target individuals to achieve convincing results. Additionally, deepfake technology enables lip-syncing and voice cloning, allowing for the manipulation of audio recordings by synchronizing lip movements with synthesized speech and replicating a person's voice based on minimal audio data. Examples of deepfake misuse targeting women include celebrity impersonation, revenge pornography, and political manipulation, Currently, the most prominent danger posed by deepfakes primarily targets women, with 96 percent of instances involving nonconsensual pornography circulating online.[50] While celebrities are the main focus, there's a growing trend of deepfakes being employed for malicious purposes such as fabricating revenge porn, according to Henry Ajder, head of research at the detection firm Deeptrace in Amsterdam.[51] This highlights the urgent need to understand and address the profound implications of this technology for women's safety and privacy.

DEEPFAKES & IT'S IMPACT ON WOMEN'S SAFETY AND PRIVACY:

Deepfakes pose significant risks to the safety and privacy of women, manifesting in various forms of harm and exploitation. The psychological and emotional toll of encountering deepfake content

[50] Sally Adee, *What are Deepfakes and How are they created? ,* IEEE Spectrum (29 Apr,2020) https://spectrum.ieee.org/what-is-deepfake Last visited 26 May 2024.
[51] *Ibid.*

can be profound, leading to feelings of anxiety, fear, and trauma among victims. The knowledge that one's likeness can be manipulated and weaponised without consent creates a pervasive sense of vulnerability, impacting mental well-being and exacerbating existing trauma for survivors of gender-based violence.

A report by Sensity AI, The State of Deepfakes 2019 Landscape, Threats, and Impact, found that 96 percent of deepfakes were non-consensual sexual deepfakes, and of those, 99 percent were made of women.[52] Deepfakes are a relatively new way to deploy gender-based violence, harnessing artificial intelligence to exploit, humiliate and harass through the ages-old tactic of stripping women of their sexual autonomy.[53] While celebrities are the main focus of deepfakes, it is becoming more common for everyday women and female public figures of all sorts to be targeted. In 2018, Rana Ayyub an Indian investigative journalist, after she had made political comments regarding the child rape of a Kashmiri girl. The pseudonymous users circulated a viral deepfake sex video featuring her was circulated all over social media platforms alongside her phone number, address, and the phrase, "I am available" resulting in her social media platform getting overwhelmed with death and rape threats. Despite calls for protection at national and international levels, Ayyub continued receiving obscene deepfake videos that attempted to slut shame her. In an article detailing her experiences, Ayyub stated that she now practices self-censorship, has withdrawn from various digital spaces, and fears people taking pictures of her as they may be used to create more deepfakes. In another instance of deepfake video of actress Rashmika Mandanna , reacting to which she described the deepfake video incident as "extremely scary" and also expressed her concern over the misuse of technology that puts individuals at risk.

A report conducted by Twicsy, a social media provider, shows that 94 % of female influencers on Instagram fall victim to deepfake pornography with the risk increasing by 15.7% for every 10,000 followers an influencer gain.[54] In terms of the regions, influencers from the U.S. were found to be the most targeted, with 10% of them being susceptible to deepfake content. Indian origin influencers were found to have a 6% chance of being targeted followed by Brazil at 5% and

[52] Suzie Dunn, *Women , Not Politicians, Are Targeted Most Often By Deepfake Videos, <* https://www.cigionline.org/articles/women-not-politicians-are-targeted-most-often-deepfake-videos/> Last visited at, 27 May 2024.
[53] *Ibid.*
[54] The Hindu Bureau, *Over 90% female influencers on Instagram fall victim to deepfake pornography, finds study. (20 May, 2024), < https://www.thehindu.com/sci-tech/technology/over-90-female-instagram-influencers-fall-victim-to-deepfake-pornography-finds-study/article68196062.ece>*

Indonesia at 3%.[55] Social media influencers have been proven to be impacted by the deepfake issue depending on the platform they use. Because Instagram is primarily a visual platform, influencers are the most vulnerable, with a 94% risk of being targeted.

Deepfakes depict women partaking in non-consensual activities without ever having engaged in them, inciting abuse on those who do not want the attention and do not have adequate resources to address these fabrications.[56] In turn, the effects of deepfakes on women can have social, professional, and personal ramifications.[57] For example, Noelle Martin, when she was a high school student her face and personal information were used to create deepfake pornographic content.[58] As a result, she faced death threats, rape threats, extortion, stalking and unwanted sexual advances. Although she sought help from authorities and government agencies, there was no resolution. The deepfake attacks have a lasting impact on her social life, law school prospects and comfort in public settings.[59]

Cara Hunter, a Northern Irish politician, was another victim of deepfake pornography. During the late stages of her election campaign in 2022 and a couple of weeks before she was elected as the Social Democratic and Labour Party (SDLP) Member of the Legislative Assembly (MLA) for East Derry, Cara found that a pornographic video in which she appeared to be engaging in an oral sex act was circulating online. Cara told iNews:

> I was at a family party, it was my grandmother's 90th birthday, I was surrounded by family and my phone was just going ding, ding, ding. And over the next couple of weeks, it continued like that. I remember my cheeks flashing red and thinking, 'Who is this person? Did I have sex with this person?' Two days after the video started doing the rounds, a man stopped me in the street when I was walking by myself, and asked for oral sex.[60]

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[55] *Ibid.*
[56] Chesney, R., & Citron, D. (2019b). Deepfakes and the new disinformation war: The coming age of post-truth geopolitics. Foreign Affairs, 98, 147. https://heinonline.org/HOL/LandingPage?handle=hein.journals/fora98&div=18&id=&pa ge=
[57] TRT World. (2021). Deepfakes and cheapfakes: The biggest threat is not what you think. https://www.trtworld.com/magazine/deepfakes-and-cheap-fakes-the-biggest-threat-is-not-what-you-think-43046
[58] Paris, B., & Donovan, J. (2019). Deepfakes and cheap fakes. Data & Society. https://datasociety.net/wp-content/uploads/2019/09/DS_Deepfakes_Cheap_FakesFinal-1- 1.pdf
[59] *Supra 11.*
[60] Mark Scott, Deepfake porn is political violence, *Politico, (*February 8, 2024) < https://www.politico.eu/newsletter/digital-bridge/deepfake-porn-is-political-violence/>

There is another story of two Zimbabwean women who recounted their experiences as victims of revenge porn on BBC's The She Word; one was disowned and consequently unable to complete her education, while the other lost her job.[61] For revenge porn victims, it is common that they suffer from anxiety or despair, PTSD(Post-traumatic stress disorder), or substance addiction. Interestingly, a study emphasized that male victims of image-based sexual abuse report feeling less guilt and less self-blame than female victims in the same circumstance.[62]

Studies have revealed that individuals targeted by deepfakes and image-based sexual abuse (IBSA) experience significant psychological distress, face both online and offline harassment, suffer from mental health problems, contemplate suicide, endure harm to their professional and personal reputations, and feel violated in both personal and physical aspects, despite not being involved in the depicted activities.[63]

From a legal and ethical standpoint, deepfake technology presents complex challenges in safeguarding women's privacy rights and ensuring accountability for perpetrators. Existing laws and regulations often fall short in addressing the nuances of deepfake manipulation, leaving victims with limited recourse for seeking justice or recourse. The proliferation of deepfake content also raises questions about consent and autonomy, highlighting the need for robust legal frameworks to protect individuals from exploitation and harm.

MOTIVATIONS OF THE PERPETRATORS:

There appear to be patterns that have been identified in the past between criminals and the objectives behind their conduct, although the list of patterns is not exhaustive. This is because we will not be able to investigate thoroughly the motivations behind every incidence of criminal sexual abuse. While those who commit image-based sexual abuse are typically known to have done so with evil intent from the beginning, there have been instances where friends and family have committed the crime without any apparent reason. There is a study which depicts that 56.9% of those who experienced such abuse and victimization reported that one or more of their

[61] "The She World", BBC WORLD SCIENCE TV, 13 th Dec 2019, https://www.bbc.co.uk/programmes/p07xs7qs
[62] Youtube, "Meet The Women Being Deep faked Into Porn by AI | Deepfake Porn: Could You Be Next?", BBC THREE, 3 Nov. 2022, https://www.youtube.com/watch?v=Q-S-amtvcd8.
[63] Jennifer Laffier, Aalyia Rehman, *Deepfakes and Harm to Women,* Journal of Digital Life and Learning vol.3 (2023)

perpetrators were their intimate or ex-partners. Another 64.3% of reported one or more of their perpetrators were their friends or family members, and 15.9% reported they did not know who their perpetrators were.[64] It shows that there are plenty of reasons why image-based abuse occurs, ranging from sexual gratification and violating someone's consent by complete strangers to revenge by various offenders such as ex-partners or resentful family members. The following list contains common reasons why people commit image-based sexual violence.

Sexual Pleasure

Suppressing desires through physical and/or psychological stimulation of senses is one of the most common reasons for image-based sexual abuse.

Bullying through Power Exertion

This is the situation in which the perpetrator of image-based sexual abuse regularly inflicts psychological and emotional trauma on the victim only because they can, generally with the goal of controlling the victim. Deepfake technology poses significant risk for victims of domestic violence because perpetrators can use deepfakes to threaten, blackmail, and abuse them.[65]

Circumventing Consent

Like other forms of sexual abuse where the crux is the absence of consent, perpetrators of image-based sexual abuse, especially in deepfakes as we shall see below, are motivated by the possibility of sensory simulation through AI-altered videos and aim to circumvent the need to seek and obtain consent.[66]

Revenge

Revenge is a counteraction perpetrated to cause injury or harm to the victim, usually in return for an injury or wrong suffered or perceived to have been suffered at their hands. Revenge porn is the exploitation of non-consensual intimate image distribution, which leads to violation of person's rights. Image-based sexual abuse can be committed by an aggrieved party or an ex-intimate partner

[64] Karasavva, V., & Forth, A. (2022). Personality, Attitudinal, and Demographic Predictors of Nonconsensual Dissemination of Intimate Images. Journal of Interpersonal Violence, 37(21-22). https://doi.org/10.1177/08862605211043586. (Last visited on 19 May 2024, 11:58 A.M.)

[65] Kweilin T. Lucas, Deepfakes and Domestic Violence: Perpetrating Intimate Partner Abuse Using Video Technology, < https://www.researchgate.net/publication/361337909_Deepfakes_and_domestic_violence_Perpetrating_intimate_partner_abuse_using_video_technology>

[66] Chidera Okolie, Artificial Intelligence-Altered Videos (Deepfakes), Image-Based Sexual Abuse, and Data Privacy Concerns, Journal Of International Women's Studies Vol.25 Iss. 2, March 2023, < https://vc.bridgew.edu/cgi/viewcontent.cgi?article=3079&context=jiws>

who has in their possession or come in contact with explicit content belonging to the victim. The perpetrator then uses this content to exert revenge on the victim solely for causing injury or damage to social reputation or to exert power over the victim. When a person's explicit images are distributed without permission, this can be a method of getting back at an ex-partner who chose to leave the relationship, especially where certain constraints exist which make it difficult for the perpetrator to meet directly with the victim.[67]

In 2018, a famous YouTuber found that in a bid to exert revenge, a sexual video of her had been leaked online by her former romantic partner sometime after the end of their relationship. As a result, Chrissy Chambers developed anxiety, insomnia, posttraumatic stress disorder (PTSD), and soon began to abuse drugs to numb the pain. BBC received reports on the backlash she has had to face since the incident with several people calling her unsavory names and disassociating themselves from her.[68]

With deepfake, the perpetrator can easily make revenge porn of the victim to make them suffer and due to this the victim can suffer through various trauma, anxiety etc.

Sextortion

The Cambridge Dictionary (2022) defines sextortion as a crime of the digital age, involving the practice of forcing someone to do something, particularly to perform sexual acts, by threatening to publish naked pictures or sexual information about them.[69] It is the threatened dissemination of explicit, intimate, or embarrassing images of a sexual nature without consent, usually for the purpose of procuring additional images, sexual acts, or money.[70] Victims of image-based sexual abuse may be blackmailed for financial gain or sexual favors by the abuser threatening to reveal any obscene images they may have.

Injury to Social Reputation

Example of Northern Irish politician Cara Hunter, Indian journalist Rana Ayub, the Bangladeshi politician are prime examples of the victims of deepfake videos and due to this the offender caused injury to their social life, and reputation. The offenders make deepfake video

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[67] *Ibid.*

[68] BBC, Chrissy Chambers: Revenge porn almost killed me, (18 January,2018) < https://www.bbc.com/news/technology-42733034>

[69] < https://dictionary.cambridge.org/dictionary/english/sextortion#:~:text=Meaning%20of%20sextortion%20in%20English&text=the%20practice%20of%20forcing%20someone,crime%20of%20the%20digital%20age.>

[70] Patchin J. W., & Hinduja, S. (2020). Sextortion Among Adolescents: Results from a National Survey of U.S. Youth. *Sexual Abuse: A journal of research and treatment.* < https://pubmed.ncbi.nlm.nih.gov/30264657/>

causing damage to their social image and spread it on social media because social media is the place where it is difficult to control the spread and there is highly chance that various persons in the victim's personal networks may come in contact with the deepfakes.

STRATEGIES FOR MITIGATING DEEPFAKE THREATS

In response to the growing threat of deepfake technology to women's safety and privacy, various strategies have been proposed to mitigate its harmful effects. These strategies encompass technological solutions, policy and legal measures, as well as education and empowerment initiatives.

Technological Solutions

In an article by Citron and Chesney (2019)[71]; Deepfakes: A Looming Challenge for Privacy, Democracy, National Security, they emphasize the importance of technological solutions in combating the threats posed by deepfake technology. They discuss several technological approaches that can potentially mitigate the impact of deepfakes:

1. Detection Algorithms:

   Deepfake content can be detected through the algorithm designed for such purpose. Such algorithms analyze various features of images, videos, such as facial expressions, blinking patterns, and inconsistencies in audio-visual elements, to identify signs of manipulation. By implementing robust detection algorithms, platforms and users can more effectively identify and flag deepfake content.

2. Digital Watermaking:

   Watermarking involves embedding invisible or semi-visible markers within images or videos during the creation process. These markers serve as unique identifiers, enabling verification of content origin and integrity. Digital watermarking can help differentiate between genuine and manipulated media, enhancing trust and accountability in online discourse.

3. Collaborative Platforms and Tools:

   Collaborative platforms and tools can foster innovation and coordination in the ongoing fight against deepfake manipulation. By sharing expertise, data and resources to improve detection algorithms and enhance media authentication

[71] Citron, Danielle Keats, and Robert Chesney. "Deep Fakes: A Looming Challenge for Privacy, Democracy, and National Security." California Law Review 107.1 (2019): 175-216

techniques, there can be collaborative efforts can be made among technology companies, researchers, and policymakers to develop and deploy effective countermeasures against deepfakes.

Legal Solutions

In both the Indian and international contexts, existing laws provide some level of recourse against the misuse of deepfake technology, encompassing areas such as defamation, intellectual property, and privacy statutes. However, these laws encounter inherent limitations, leaving gaps in addressing deepfake-related privacy issues.

Various sections of the Information Technology (Amendment) Act, 2008, in combination with laws of the Indian Penal Code, 1860[72] now, Bhartiya Nyay Sanhita, 2023 (Since the typical objective is to commit cyber fraud, identity theft, or blackmail via manipulated photos or videos) may be used to address this issue. According to IPC,1860 the accused might be charged with defamation sections 499 and 500(Now, section 356 of Bhartiya Nyay Sanhita,2023) The criminal defamation act can be used when someone makes a Deepfake audio or video in which he seems to say anything disparaging about that person's reputation. This category may have a fake video where someone says something disturbing.

The concept of obscenity is usually considered as violation of community standard and public decency and which is repulsive and prurient to society. Within the purview of Indian legal regime, section 292 of India Penal Code[73](Now, section 294 Bhartiya Nyay Sanhita, 2023) specifically provide punishment for sale, distribution, importation/exportation of obscene material. In the same way, there is punishment provision for dissemination of obscene content in electronic form as mentioned in the section 67 of Information Technology Act, 2000.[74]

Section 66E of the Information Technology Act 2000 establishes penalties for privacy violations. Similarly, the sections 67A and 67B of Information Technology Act, 2000 penalize the transmission or publication of sexually explicit content, or sexually explicit depictions of children by electronic means, respectively. Identity theft entails the use of fraudulent or deceptive means to steal an individual's identity details for gaining access to resources or obtaining credit and other advantages in the victim's name. Even, the IT Act, 2000 also consider cheating through personation

[72] Indian Penal Code of 1860, No.45, Acts of Parliament of 1860 (India)
[73] The Indian Penal Code,1860, § 292, No. 45, Acts of Parliament of 1860 (India)
[74] Information Technology Act, 2000, § 67, No. 21, Acts of Parliament of 2000, (India)

by using computer facility as penal provision mentioned in its section 66D. It is important that social media intermediaries must implement the establishment of self-regulating body to address any grievances(if any) and supervise the follow-up of code of ethics as mentioned in section 11 of the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021.[75] It is also expected from social media intermediary to formulate a due diligence document and regulation where explicit information must be shared with users of computer resource regarding prohibition of uploading or sharing any obscene, prurient or pornographic content. An intermediary may terminate the access of concerned user in case of non-compliance of such regulations by any user.[76] Recently, a proposed Digital India Act, 2023 draft was discussed by Ministry of Electronics and Information Technology wherein there is discussion of taking appropriate action against users who are involved in revenge porn, cyber-bullying. There is reference of conventional quality testing mechanism of risk prone AI based technology in the interest of supervision of digital content and content moderation on periodic basis.[77]

Internationally, countries possess varying legal frameworks governing defamation, privacy, and intellectual property that offer legal recourse against deepfake-related privacy issues. For instance, defamation laws in common law jurisdiction or civil codes in continental legal systems may provide a basis for legal action against individuals disseminating defamatory deepfake content. Privacy laws such as the General Data Protection Regulation(GDPR) in the Europian Union aim to protect personal data and privacy rights. However, limitations arise when deepfake content doesn't directly involve the misuse of personal data but instead manipulates and individual's likeness or voice.[78]

However, these laws might struggle to address deepfakes that utilize original content in a transformative manner, raising challenges in determining infringement.[79] In both Indian and international contexts, the limitations of existing laws in effectively addressing deepfake-related

[75] Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021, § 11, No. 21, Acts of Parliament of 2021, (India).
[76] Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021, § 3, No. 21, Acts of Parliament of 2021, (India).
[77] Proposed Digital India Act 2023, Digital Indira Dialogues, 9th March,2023, MINISTRTY OF ELECTRONICS AND INFORMATION TECHNOLOGY, GOVERNMENT OF INDIA, https://www.meity.gov.in/writereaddata/files/DIA_Presentation%2009.03.2023%20Final.pdf
[78] Hartzog, W., & Richards, N. Privacys constitutional moment and the limits of data protection. BCL rev., 61,1687. (2020).
[79] Langa, J. Deepfakes, real consequences: Crafting legislation to combat threats posed by deepfakes, 101 BUL Rev., 761. (2021).

privacy issues lie in their inability to adapt swiftly to the nuances and evolving nature of deepfake technology. The challenge persists in keeping pace with technological advancements and developing comprehensive legal frameworks capable of addressing the complexities presented by deepfake content that blurs the boundaries between truth and manipulation. This necessitates a nuanced approach and potential reforms in legislation to bridge these gaps and provide robust protection against deepfake-related privacy infringements. These are as follows:

1. **Expanded Defamation Law**: There is a need to expand defamation law to cover the creation and dissemination of deepfakes that harm individuals' reputations. This would entail holding creators and disseminators of malicious deepfakes accountable for the harm caused to their subjects, similar to the legal principles applied to traditional forms of defamation.

2. **Publicity Rights**: There is a need to strengthen publicity rights laws to provide individuals with greater control over the use of their likeness. This would enable individuals to pursue legal action against those who use their images or videos without consent, including in the creation of deepfakes for malicious purposes.

3. **Platform Liability**: There is also a need to discuss the potential role of intermediary liability laws in holding online platforms accountable for facilitating the spread of harmful deepfake content. By exploring ways to incentivize platforms to implement measures for detecting and removing deepfakes from their platforms, and also considering the balance between liability and platform autonomy.

FUTURE DIRECTIONS AND CHALLENGES:

In addressing the future directions and challenges surrounding the threat of deepfakes to women's safety and privacy, it becomes evident that despite advancements in technology and awareness efforts, significant gaps persist, necessitating ongoing vigilance and innovation. Looking ahead, several key considerations emerge, alongside potential avenues for further research and intervention.

One crucial aspect pertains to the evolving landscape of deepfake technology itself. As artificial intelligence continues to advance, so too do the capabilities of deepfake algorithms, posing an escalating challenge for detection and mitigation efforts. Moreover, the democratization of deepfake tools means that individuals with minimal technical expertise can create convincing

fake videos, amplifying the potential for harm. Therefore, future research should focus on staying abreast of these technological developments and devising robust countermeasures that can adapt to evolving threats.

Another pressing concern is the persistent gaps in protection and prevention efforts. Despite growing awareness of the dangers posed by deepfakes, there remains a lack of coordinated action at both the institutional and individual levels. Legal frameworks often lag behind technological advancements, making it difficult to prosecute perpetrators or hold platforms accountable for hosting malicious deepfake content. Moreover, there is a need for greater collaboration between tech companies, policymakers, and civil society organizations to develop comprehensive strategies for addressing deepfake threats. Research in this area should explore innovative approaches to policy development, as well as mechanisms for fostering cross-sectoral cooperation.

Furthermore, there is a critical need to prioritize the empowerment of women in navigating the digital landscape. Digital literacy programs tailored to women can play a crucial role in equipping them with the skills and knowledge needed to identify and respond to deepfake threats effectively. These programs should not only focus on technical aspects but also address broader issues such as online safety, privacy protection, and media literacy. Additionally, support networks and resources for victims of deepfake abuse are essential for providing assistance and advocacy in the aftermath of an attack. Research efforts should examine the efficacy of existing support mechanisms and identify areas for improvement to better meet the needs of affected individuals.

Amidst these challenges, however, there are also opportunities for innovation and collaboration. Technological advancements such as blockchain and decentralized authentication systems hold promise for enhancing the integrity of digital content and combating deepfake manipulation. Likewise, interdisciplinary research initiatives that bring together experts from fields such as computer science, law, psychology, and gender studies can yield valuable insights into the multifaceted nature of deepfake threats. By fostering cross-disciplinary dialogue and collaboration, researchers can develop more holistic approaches to addressing the complex challenges posed by deepfakes.

CONCLUSION

In conclusion, the proliferation of deepfake technology poses a significant threat to the safety and privacy of women in the digital age. Throughout this paper, we have explored the multifaceted

impact of deepfakes on women, encompassing psychological distress, social and professional repercussions, and profound ethical and legal dilemmas. The evidence presented underscores the urgent need for proactive measures to mitigate these risks and protect women from harm. As we navigate the complexities of deepfake threats, it is evident that a multifaceted approach is required. Technological solutions, including advancements in deepfake detection and authentication tools, offer promise in combating the spread of malicious content. However, such measures must be complemented by robust policy and legal frameworks that address the root causes of deepfake vulnerability and hold perpetrators accountable for their actions. Collaboration between governments, tech companies, and civil society is essential to enact meaningful change and establish effective safeguards for women's safety online.

Furthermore, education and empowerment initiatives play a crucial role in building resilience among women and equipping them with the knowledge and skills to identify and respond to deepfake threats. Digital literacy programs tailored to address the specific challenges faced by women can empower individuals to navigate the digital landscape safely and assert their rights in the face of online harassment and abuse. Additionally, fostering support networks and resources for victims of deepfake exploitation is essential in providing avenues for recovery and redress. Looking ahead, we must remain vigilant in monitoring emerging trends in deepfake technology and adapting our strategies accordingly. Persistent gaps in protection and prevention efforts underscore the need for ongoing research and innovation in this field. By staying proactive and collaborative, we can work towards a future where women can engage in the digital world free from the pervasive threat of deepfake manipulation, ensuring their safety, dignity, and autonomy are upheld.

ARTICLE- 4

Greening the Growth: Leveraging AI for Environmentally Sustainable Development in a Developed India by 2040

By- Ajayveer Mishra[80]

Abstract:

Picture the India of tomorrow, thriving in fresh air, harnessing the power of solar, and wind, and managing waste effectively. This dream or vision of successfully making India a developed and sustainable country by the year 2040 is now possible with the help of AI. Sustainability is under pressure worldwide. Developed countries must take the lead, and India aims to double its economy while ensuring sustainable development. This paper discusses how AI could bring about this change. This is where the realistic applications of AI in the fundamental sectors, will be demonstrated. While envisioning future power systems, it would be delightful to think of smart grids managing and balancing energy and incorporating renewable resources. Or picture artificial intelligence for farming for increased yields. We will also discover how artificial intelligence can help redefine waste management. It is from learning from such developed countries as Germany and Sweden that one can develop such models. We will then examine such successful strategies and determine how the Indian market can adopt them. The indigenously developed Project Amravati, a green city project in India, can aptly be quoted as a ray of hope. This project presents a vision, passion, and dedication to sustainable initiatives toward the foundation of a network of sustainable cities. It can also help steer people toward being more environmentally friendly and using resources responsibly. For example, think about posts on Facebook, Twitter, etc, that make us subtle suggestions of what we need to save or reuse. India 2040: the wait is on—it doesn't matter how quickly the nation advances if it happens at the expense of the environment. And yet, for this vision to come to life it requires our combined action. This paper ends by moving to the next phase with a call to action on how readers of this work can be part of this journey.

Keywords: Artificial Intelligence (AI), Sustainable Development, Developed India, Smart Grids, Precision Agriculture, Waste Management, Green City Initiatives, Social Media Marketing, Sustainability Awareness.

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1. Introduction:

The global community finds itself in front of a major problem – that of sustaining the environment for future humankind. The so-called developed countries which within their processes contributed most to climate change have a significant role to play in the women and the quest for a clean environment[81]. This leadership goes beyond minimizing one's personal carbon footprint; it also involves helping others 'level' up by sharing ideas and innovations so that even the nascent economies that are critical for the growth of the developing world can take advantage of these changes collectively.

In particular, India, a country which will, according to the United Nations models, become a home to more people than any other country in the world by 2027[82]. Burundi's objective of being a developed country by 2040 is an important goal that can never be realized on the backdrop of elitist unsustainable environmental practices. The coming years Indian dream is not to devastate the land to acquire, widen or maintain wealth exclusively, instead it must be to develop, prosperous with sustainable environment.

Fortunately, a powerful tool has emerged to help bridge this gap: AI = Artificial intelligence. AI presents tremendous opportunities to deal with those variably massive environmental issues and enable India for a better future, a sustainable one. Alteration in the way energy is distributed, or even Exploring new ways of farming; it becomes quite clear that AI is the answer to the future India wants – the India that is both prosperous and green.

2. AI for Sustainable Development in Different Sectors:

1. Environmental Challenges in India:

Some many critical environmental issues and concerns need to be discussed and resolved in the socio-political crisis of India to achieve the goal of sustainable development. Achieving better access to water is an issue of concern since 300 million people face water stress[83]. Transportation

[81] United Nations Environment Programme (UNEP). (2021, February 18). Emissions Gap Report 2021. https://www.unep.org/resources/emissions-gap-report-2021

[82] World Population Prospects 2022. (2022). United Nations Department of Economic and Social Affairs, Population Division. https://population.un.org/wpp/

[83] Central Ground Water Board. (2020). Ground Water Scenario in India. Ministry of Jal Shakti, Government of India. https://www.cgwb.gov.in/

and industrial pollution, mainly exhaust fumes, also remain a potential danger to the health of people in large urban centres[84]. Also, due to poor management and lack of proper waste disposal facilities, there is poor waste disposal leading to blocked landfill sites and environmental pollution[85].

Case Study 1: Smart Grid Management is the most relevant to the objective as the development of the smart grid must address the increasing dependence on electricity and the unpredictable access to it.

AI provides a strong approach to achieve a smart solution for distribution of energy and addition of green energy resources such as the solar systems and wind energy systems. AI mainly in smart electrical grids enables demand of electricity to be analyzed in real-time and hence energy restructured throughout the smart grid. This cuts losses due to various inefficiencies in the transmission processes that are characteristic of normal power networks, thus lowering costs and the company's impacts on the natural environment. In addition, AI can forecast when the demand reaches a maximum and can make adjustments, including utilizing renewable energy systems to generate electricity in response to these changes, while maintaining its efficacy as a power resource.

A real-life example of smart grids with artificial intelligence are demonstrated by Bengaluru in India. With the help of IBM, Bengaluru incorporated a smart grid system of utilizing artificial intelligence in mapping energy usage and in the supply of power. From this measure, energy losses decreased by 10% and the share of renewable energy sources increased in the city's grid of energy[86].

Case Study 2: Precision Agriculture Introduction

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[84] World Health Organization. (2022). Ambient (outdoor) air pollution. https://www.who.int/news-room/fact-sheets/detail/ambient-%28outdoor%29-air-quality-and-health

[85] Central Pollution Control Board. (2021). Solid Waste Management Rules, 2016. Ministry of Environment, Forest and Climate Change, Government of India. https://cpcb.nic.in/rules-4/

[86] IBM. (2020, September 24). How AI is powering a smarter grid in Bengaluru, India. https://research.ibm.com/blog/ibm-ai-edge-national-grid-monitoring

IOT architecture in agriculture makes use of artificial intelligence and data analysis to enhance the practice of farming in individuals' food production systems. Through satellite images of the fields and the use of sensors, AI can determine the state of the soil, therefore, farmers can use the fertilizer and pesticides selectively. This has the additional effect of preventing pollution of agricultural waters, conserving water, and improving the quality of the soil. AI can also predict the quantity of crops to be produced based on the weather condition as well as previous results therefore the farmers is in a position to schedule their resources and thus reduce the usage of water.

A successful example of the application AI in the agriculture area in India is a project of the company called "CropIn Technology Solutions. "This firm uses artificial intelligence to offer farmers specific recommendations depending on locality and the type of crops they are growing. CropIn has worked for the farmers and enhanced the yield of their crops to a range of 15-20% and decreased water consumption at a rate of up to 30%[87]. It uplifts the farmer income at the same time decreasing the amount of harm the expansion of agriculture does on the environment

Case Study 3: Waste management is another area that has been identified to be vital in the current health sector.

.Waste management is yet another important sector where AI can be useful in the achievement of sustainable development. Through the analysis of data generated from waste collection, it is possible for artificial intelligence to improve routes taken by garbage trucks as well as the amount of fuel used, hence fewer emissions. Also, AI can indicate how much waste in the future would be produced using past data and population growth rate; thus, the city can make a reasonable provision for waste disposal. Moreover, the content of waste can be investigated with the use of AI which can bring focus to the items that have a high probability of recycling.

The Surat city in India is one of the best examples of AI implementation in waste sector. Surat came up with smart waste management and one of the ideas was to use artificial intelligence to track the waste collection vehicles and their routes. This helped cut garbage truck fuel usage by 20% and reduce the incidences of overfilling of dump sites[88]. It also allows for waste management

[87] CropIn Technology Solutions. (n.d.). Our Story. https://www.cropin.com/

[88] The Economic Times. (2020, February 24). Surat's smart waste management system a model for other cities. https://www.suratsmartcity.com/Documents/Projects/ABD/abd_21.pdf

whereby wastes are sorted and encourages recycles, therefore driving the creation of a cleaner environment.

3. Learning from Developed Nations:

Learning from Developed Nations: The need for Sustainable Development in India: Civil Society as a Springboard Since India is eager to make itself a developed nation by 2040, it would be in its interest to learn from some of the other developed countries and Northern European countries such as Germany and Sweden. These countries have realized remarkable success in balancing sustainability with economic development, an experience that would be helpful to India.[89]

Sustainability Strategies and Policies:

Moreover, these nations implemented a top level of green infrastructure. This ranges from coming up with and embracing renewable energy resources such as solar, wind and geothermal among others. For example, Germany is at the forefront of renewable sources generation, with the country's electricity being partly generated through clean sources.

Another focus involves sustainable transport, which is without a doubt, one of the most crucial in the present world. Similarly, Germany and Sweden have embarked on policies aimed at shifting towards cleaner means of transport through improved and development of public transport, cycling and electric vehicles charging infrastructure.

Technological Advancements and Innovation:

The developed countries are also the key in implementing technologies for sustainability goals since they are usually in the up and running. Germany, a nation on the cutting edge of engineering in the world, boasts of a vibrant RD system concerning clean technologies. Such as energy storage technologies of batteries and super capacitors, smart grid management, efficient buildings. Sweden, one of the leading countries in the sphere of innovation, has encouraged an active development of the startup environment specifically for the purpose of developing sustainable solutions that may be applicable in different spheres .

[89] [HIMANSHI GOEL]. (2023). India, G20 & Mission SDG 16: How Civil Society Groups Help Promote Inclusive Society. Retrieved from https://www.thequint.com/my-report/members-opinion/role-of-civil-society-to-promote-inclusive-society-sdg-16

Adapting to India's Context:

It is however important that while India can study these best practices from the aforementioned post-reform models, it understands that change is necessary and requires adjustment. The underlying and major issues include: A large population – more than one billion people that India has may be regarded as a significant obstacle to the country's progress; and Developing infrastructure – in general, infrastructure in India may be characterized as rather undeveloped. For instance, policy copying, where India tries to copy policies from another country, such as Germany, can be economically destabilising such as directly copying Germany's carbon supply price.

Here's how India can adapt these strategies:

Phased Implementation: It indicates that carbon pricing in India can be done in stages gradually to liberal sectors initially which would not heavily affect the consumers. Focus on Renewables with Local Context: Nonetheless, India which is now aspiring to become a leader in renewable power generation should consider those which are most suitable in its geographical region. For instance, solar power might be more suitable renewable power source than the wind power in some locations.

Public-Private Partnerships: Focusing on the most demanding industry and affecting the change on public transport systems in India can benefit from Public-Private Partnership to improve the infrastructure of green infrastructure and the development of charging networks for electric vehicles.

Building Domestic Innovation Capacity: It is therefore paramount to fund researches that target on clean technologies that can effectively cater for Indian needs. This will promote localized development and ensure that India does not continue to depend on technologies developed in other countries.

Conclusion:

The growth transformation path that developed countries like Germany and Sweden have taken could be considered a model for India when it comes to finding a sustainable path. To proceed with Sustainable development, India can follow a path of its choice while keeping itself

environmentally responsible by adopting the strategies, policies, and technologies used by these developed countries but doing it in its own Indian way. Morris and Rueten add that it is important to adopt these approaches in the Indian context and encourage local innovation. On its own, India cannot hope to become the developed and sustainable nation of its dream by 2040, but with a collective and conscious effort of the government, the private sector, and the citizenry, the country can get there.

4. Project Amravati - A Case Study in Sustainable Urban Development:

Project Amravati: Is C-Sush Banner of Sustainable Urban Development in India? While India is aspiring for a faster growth, it has become rather critical to have sustainable urban development and planning. Project Amravati Planned to be the new capital of Andhra Pradesh is the brightest example of green city initiatives. Now, it is time to move to the analysis of the project objectives, outcomes and contribution to the improvement of environmental sustainability in India.

Sustainable Infrastructure for a Green Future:

Standards that have to be met in Indian cities are not very high and Project Amravati wants to change that for the better. Its key principle is called smart infrastructure. This encompasses the provision of energy efficient buildings such as; lighting systems, roof gardens as well as proper building materials . These buildings will respectively consume as little energy as possible and contribute to the decrease of the city's emissions[90].

Moreover, the project aims essentially at the large scale incorporation of renewable energy sources. Solar power plant, wind farm, and even the bio energy plant all have planned to play a major role in fulfilling the energy demands of the city. This helps in the decrease of the usage of fossil fuels and in turn the encouragement of a clean energy mix for Amravati .

AI for Smart Energy Management:

[90][Sam b] (2015) https://www.scribd.com/document/366804836/Amravati-Smartcity-Plan

Project Amravati is another idea that uses modern technologies for topping up the potential of environmentally friendly constructions. Another area of significance for the city management is the provision of the energy grid which AI is expected to help in managing. AI can forecast the demand periods, how energy should be distributed optimally and how the renewable energy can be integrated to the system. This makes certain that there is a constant supply of power, without expecting notably high losses at the same time.

Waste Management and Circular Economy Principles:

Project Amravati also understands that sustainability is a concept that goes beyond the use of clean energy. Concerning the practices for dealing with wastes, the project embraces practices based on circular economy systems. This entails ensuring a proper and highly effective system of sorting waste as well as the means of collecting and processing it. Subsequently, waste can be converted into useful products, hence preventing landfill waste and encouraging recovery of resources.[91]

Current Progress and Potential Impact:

Though initiating in 2014 with a lot of pomp and show, project Amravati did not gain the speed it was presumed. Contractors in the project have faced challenges such as acquisition of the land, political instabilities, and budgetary problems that have slowed down the progress of the project. Nevertheless, a few basic infrastructural developments are currently in use such as the drainage systems and a convention centre.

They have proposed, The project under consideration still holds the important potential of helping achieve the goal of environmental sustainability in India. If properly executed, Amravati has potentials to set examples for green city with efficiency, sustainability throughout numerous areas. It would encourage other cities in India to also work towards implementing such measures, thus bring about a positive change towards sustainability in the country.

Shortcomings and Lessons Learned:

While Project Amravati has set lofty objectives to improve the living standards of people, it can be seen that there are critical deficiencies to be redesigned for any future urban projects.

[91] Khandve, P. (n.d.). Municipal solid waste management at Amravati City- Present practice and future challenges. https://www.academia.edu/21311759/

Firstly, relying on large-scale, centralised gross fixed capital formation on infrastructure can be problematic in as much as these are prone to face-offs and construction of megaprojects often entail cost overruns. The use of numerous bottom-up sustainable initiatives, where structures are expected to be less large-scale might prove more sustainable and robust. Secondly, the project focuses on innovations like Artificial Intelligence rather than highlighting the need for the citizens' involvement and collaboration. Environmental consciousness and accountability of residents require constant attention, thus making their improvement an ideal core objective for long-run community sustainability.

Lastly, the idea of making the space appealing to large companies and higher-income earners is a problem of social justice implementation. There should be provision of a good quality of life for everyone and not only for the select few or the elite of society.

Conclusion:

The problems stated are inexpiable but Project Amravati is an important project that can unravel the approach India has towards sustainable urbanism. It has implications for the future and, therefore, conducting an analysis of its progress is indeed quite useful. Thus, applying decentralised structure, active citizens' participation, and putting citizens in the focus to reach the fair and sustainable development, India can help turn the vision of the sustainable cities into a lifelike reality for every single citizen.

5. Nudging for Sustainability through AI-powered Marketing:

Marketing as a Means of Gentle Prodding Towards Sustainability with the Help of Artificial Intelligence.

In the transformation to the 'Sustainable' future the help of technology is needed but more importantly the change in Behaviour of people. Such is the role of marketing in the modern world experienced in synergy with AI capabilities. Psychology can be used to guide decisions in a way that promotes sustainable behaviors in this manner: By knowing how to appeal to the part of an individual's psyche that tells them to make those decisions, it becomes possible to deliver the right messages that would get a person to act in an eco-friendly way.[92]

[92] Ruddocks Solicitors. (2024). Artificial intelligence (AI) in sustainable marketing https://www.ruddocks.co.uk/news/artificial-intelligence-ai-in-sustainable-marketing

The Power of Repeated Exposure:

Among the best-known psychological phenomena used in marketing, there is the well-known phenomenon of repeated exposure. When a message or an image is repeated at different points in time, that message or image becomes familiar to the mind and is easy to remember. This process is called the mere-exposure effect that enhances the positive feelings towards the message and can impact the behavior at the subconscious level. For instance, it is possible to habituate people to the pictures of clean beaches and healthy forests, so they unconsciously want to protect the environment.

AI for Personalized Environmental Awareness:

Repetition exposure in the environmental awareness campaigns is effectively useful, and Artificial Intelligence (AI) can be a useful tool in the process. Machine learning technology allows to process big amounts of social media data concerning the users' demographic and psychographic characteristics, interactions, etc. This makes it possible to design messages that are specific to every person and that can really affect them. For instance, it helps to identify the users who might be interested in activities conducted outside and create targeted social network campaigns showing the necessity of behaving ecologically in more bucolic regions.

Ethical Considerations in AI-powered Marketing:

On the one hand, sustainable development represents hope for improving the living conditions of those with lower backgrounds through the implementation of AI applications. First of all, it is necessary to declare the specific use of artificial intelligence in social media campaigns. The consumers need to understand why they are being targeted or followed based on their profiles specific data.

Second, AI marketing strategies should not employ preying on the weaknesses of the users. It should be more about the education and entertainment of the consumers and making people happier and healthier, not about the creation of the feelings of guilt.

A Successful Example: This case is known as the #OneLess Straw Campaign

The unsuccesful social media campaign to cut the global use of plastic is a fine example of a global movement engaging AI technology. The implementation of the AI technology in the #OneLessStraw campaign entailed identifying users and trends on social media platforms that could be of great influence in the fight against excessive use of plastic straws. It thus enabled them to disseminate their message in an appropriate and planned manner so as to ensure that a large number of people received the message and utimately embarked on conducting a discussion on sustainable practices across the world. Overall the success of the campaign can once again show how people are now using AI for their campaigns in an ethical way.

6. Envisioning a Developed and Sustainable India by 2040:

Imagine a future India. The big cities glow with clean energy, their buildings' roofs and domes bristling with solar panels and windmills. Flora and fauna of various nature distribute themselves across cities, providing a break from overload. In other words, proper and efficient systems of waste management cut down on the effects on the surrounding environment. This is the dream of a developed and integrated India by 2040 – a dream achievable but can only be realized if people, governments and corporate entities do good.

A Glimpse into a Sustainable Future :

Clean Air: Picture city environments that are not full of smoke during particular seasons or all year round. Children have fun going around in the various parks with lungs filled with clean air due to increase use of electric cars and industries with clean technologies.
Renewable Energy Sources: Imagine exhaustively spread solar fabrics and wind mills, a panorama of clean energy centers for lighting up homes and running industries.
Efficient Waste Management: It is easy to think of an intelligent network that allows for a coordinated approach to waste disposal and recycling that reduces the amount of material that ends up in landfills.

Citizen Participation: To establish its own identity, security, and a sustainable social habitat for healthy and constructive development, each society needs a solid foundation on which to build change[93].

"What people fail to realize is that this sustainable future can only be brought into existence with citizens' engagement."

Here's how individuals can contribute:

Embracing Sustainable Practices: Small changes such as choosing to use public transport, avoiding the use of water and energy where not necessary, and practicing the mentality of using only what is necessary – all of these tally up to create a massive impact. **Spreading Awareness:** Promoting to friends, relatives, and other circles regarding sustainability spreads awareness and helps in the constant change for the betterment of the environment. **Holding Stakeholders Accountable:** People can demand more stringent policies to be formulated to save the environment, they can compel certain organisations and companies to be responsive financially and legally to preserve the environment.

Policy and Regulation: How to build the Framework for the Sustainable Future The policies implemented by the state cannot be overemphasized as a critical facet that can guide India towards sustainable development[94].

Here are some key considerations:

Incentivizing AI for Sustainability: Governments are in a position to set up regulation structures and incentives that would encourage the implementation and use of AI systems for environmental purposes like smart grids and agricultural machinery.

Regulation for Ethical AI Development: Strong guidelines need to be put in place in order to promote the ethical and responsible creation of AI; there is a requirement that must be met in

[93] United Nations University (UNU). (2018, October 4). Engaging citizens in science policy: A global research report [Report]. United Nations University Institute for Comparative Studies in Decision-Making (UNU-CS). https://unu.edu/topics/citizen-participation?page=4

[94] Business Today. (2023, August 25). Sustainable India 2047: Green growth and environmental stewardship [India @ 100]. https://www.businesstoday.in/opinion/columns/story/esg-and-india-inc-companies-need-not-forego-profit-in-order-to-attain-sustainability-goals-both-can-co-exist-356657-2022-12-16

eradicating all the inclined bias and in making many aspects of AI's data gathering and use transparent.

Investing in Green Infrastructure: To facilitate enabling environment of sustainable future more investment of government through policy support and promotion of clean energy infrastructure, sustainable transport system and green building technologies that must be encouraged and enabled prominently[95].

Building a Digital Bridge:

Inclusive access as a top population-level principle, Although AI can be viewed or is a very useful tool in bringing about environmental change, this has to come with equal access.

Here's how to bridge the digital divide:

Investing in Digital Infrastructure: Connecting all the communities of the world with broadband internet, particularly those from rural and underprivileged areas, is the next frontier for a more standardized ability to apply AI for sustainability purposes. Promoting Digital Literacy: That is why measures designed to increase levels of critical digital literacy and AI-readiness of the population can enable the benign use of AI for sustainable outcomes.

Affordable and Accessible Technology: The development of cheap and intuitive AI technologies aim at promoting equal opportunities in carrying out technological functions, in order to create a better world for all.

In this paper, I propose the idea of making India more sustainable for the benefit of its society and the environment.

Achieving a developed and sustainable India by 2040 brings a multitude of benefits:

Improved Public Health: Less air and water pollution will translate to a healthier population since people will not be falling ill frequently with some kinds of diseases. Enhanced Economic Prosperity: Envir onmentalism can promote innovation towards better green

[95] Kumar, P., & Rahman, Z. (2021). Green infrastructure: A roadmap towards sustainable development. [Publication]. ResearchGate. https://www.researchgate.net/publication/355472972_Urban_Green_Infrastructure_

technologies which means that new jobs can as well be created and this will lead to economic growth.

A More Resilient Future: Climate change affects every nation in different ways, and therefore, it will be beneficial for the India to prevent adverse effects of climate change and utilize natural resources judiciously for the better future of the upcoming generations.

7. Conclusion:

This paper has shed light on possible ways with which AI will be used to transform arrow of India into a developed and sustainable nation by 2040. It is often stressed the need for environmental sustainability, and infrastructural prototyping.

Here we will present some ideas for using AI in solving some of the most important environmental problems which not only remain unanswered in the frameworks of the current approach but also impedes the further development of the globe, such as energy management, water deficit, and waste disposal. As having been elaborated in this paper, AI is directly involved in improving energy systems though smart grids, enriching life through personal virtual assistants, and helping feed the world through precision farming.

However, it needs more effort to work within the right plan that can make it successful, and it calls for a combination of efforts to be effective in this aspect. Such fearing approaches can be learned from successful examples of such countries as Germany and Sweden which have put emphasis on the carbon pricing, the green infrastructure, and technologies. India needs to adopt these strategies to this context where they strive to encourage an indigenous innovation of clean technologies.

However, to achieve those goals, technology alone is insufficient. Citizen participation is vital. The public can participate in minimizing the adverse effects of globalization by and supporting stakeholders that use environmentally friendly practices, educating others, and pressuring influential institutions to change. The formulation of policies and policies within various organisations is the responsibility of policymakers. Some of them include adopting sustainable policies on AI development and usage, overseer the use of ethical standards in AI development, and the promotion of green infrastructure among others.

To see the topic from another perspective, one should focus on developing a comprehensive digital environment and maintaining equal access to using AI. Ensuring that the populace is connected to

the internet and gets to learn about the basics of using the internet will help also support them in their efforts to promote accountability towards the use of AI to develop environmental solutions. It has been implied that creating a solid foundation for the sustainable development of our communities, our nation, and our world is indeed now in our hands – and these hands include the hands of the government, the private sector, and the citizens. It presupposes a social experiment in the fields of innovation and cooperation as well as in terms of the vision that is shared among all organizational members. The collective goal of considering AI as the technological advancement, getting the people involved, and having suitable political moves will in one way or the other enable us to have a dream of a developed and sustainable India. Let all of us join together to create a new innovative India, to create a Sustainable India where environmental efficiency goes hand in hand with economic success to ensure better living standard for every next generation.

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ARTICLE NO- 5

"The Impact of Digitalization on Environmental Dispute Resolution: An Analysis of the National Green Tribunal's Efficacy and Accessibility in India"

Abstract

The effectiveness and accessibility of India's National Green Tribunal (NGT) are the main topics of this paper's investigation of the effects of digitization on environmental dispute resolution. The NGT and other specialized judicial organizations play an increasingly important role as environmental concerns grow. The study looks at how digital technologies have changed how the NGT operates, allowing for increased openness, more effective case management, and wider public access. The NGT has increased its capacity to manage an increasing volume of cases, expedite processes, and shorten the adjudication period by utilizing digital platforms. Additionally, technology has improved public participation by enabling virtual hearings and increasing the accessibility of information, so removing geographical obstacles that traditionally restricted access to justice.

The constraints and difficulties brought on by this digital transition are also covered in the article. Critical analysis is done on topics including the digital divide, cybers security risks, and the requirement for technological competence among stakeholders. The report emphasizes that although digitization has many advantages, it also requires a strong infrastructure and regular updates to stay up to current with new technology.

A thorough grasp of the NGT's performance following digitization is possible because to empirical data from case studies and conversations with litigants, legal experts, and environmental activists. The results show that digital tools have significantly improved the tribunal's accessibility and efficiency, although there are still issues due to regional differences in digital infrastructure and literacy.

The constraints and difficulties brought on by this move to digital technology are also covered in the article. Critical analysis is performed on issues including the digital divide, cyber security

dangers, and stakeholders' requirement for technological skills. While digitization has many advantages, the study shows that in order to stay up to speed with technology, a strong infrastructure and regular updates are also necessary.

As the article concludes, if the underlying challenges are addressed, digitization has the potential to greatly improve environmental justice in India. The NGT's experience can be used as a template by other national and international courts to demonstrate how digital technologies can revolutionize the legal system and advance sustainable development.

Keywords: National Green Tribunal, Environmental Disputes, Cyber security, Digitization, Technology.

Research objective

1. Examine the function and efficiency of India's National Green Tribunal (NGT) in resolving environmental issues.
2. Examine the impact of digitization on environmental dispute resolution procedures.
3. Evaluate the use of technical instruments in environmental conflict settlement .
4. Investigate the accessibility of environmental conflict resolution processes for stakeholders, particularly in remote places.
5. To identify obstacles and considerations for digitalize environmental dispute resolution.
6. Discuss the potential impact of digitization on environmental dispute settlement.

Research Methodology:

Data Collection.

The research takes a mixed-methods approach, incorporating qualitative and quantitative data. Primary data is gathered through interviews with legal experts, NGT officials, and stakeholders involved in environmental conflicts. Secondary data is derived from NGT's digital records, case studies, and current research on digitization in judicial systems.

Data analysis

For qualitative data, thematic analysis is used, while quantitative data is studied using statistical approaches. The impact of digitization on the NGT's efficacy is measured in terms of case resolution time, case disposition rate, and stakeholder satisfaction.

Literature review

1. by book chapter on national green tribal by M.J. voert throws light on Digitization enhances accessibility and efficiency in resolving environmental disputes And NGT can leverage technology for faster and transparent dispute resolution.
2. By Natalia on The use of digital technologies in the administration of justice in the field of environmental crime . This paper throws the light on Digitization increased accessibility and efficiency in resolving environmental disputes.and E-justice implementation noted positive effects in resolving environmental disputes.
3. By Nariman Rajabov on Digitization of environmental regulation: legal aspects this paper throws the light on Improved identification of environmental issues and enhanced efficiency in environmental control activities.

Introduction:

Brief overview of National Green Tribunal in India:

The National Green Tribunal was formed in 2010 under the National Green Tribunal Act. It is a specialist environmental court that hears issues involving environmental preservation, natural resource conservation, and environmental degradation prevention. The tribunal is made up of experts in environmental and judicial domains who work together to make complete and informed decisions.

One of the NGT's primary functions is to resolve environmental disputes quickly and effectively. This ensures that environmental concerns are addressed quickly, preventing further harm to the environment and the public's health.

The NGT also plays an important role in enforcing environmental rules and regulations, holding violators accountable for their activities, and encouraging compliance with environmental norms. The tribunal's judgments and findings establish key precedents for future environmental protection initiatives in India.

Overall, the National Green Tribunal of India plays an important role in environmental protection and sustainable development. By offering a specific arena for environmental disputes and challenges, the NGT helps the country achieve a greener and more sustainable future.

Importance of environmental dispute resolution in the digital age:

In today's digital age, environmental conflict resolution is critical. With technological breakthroughs and the rapid transmission of knowledge, tackling environmental disputes in a timely and efficient manner is critical to the well-being of our planet and its inhabitants. Using digital platforms to resolve disputes not only speeds up the process, but also expands the scope and transparency of decision-making [96]. This accessibility is essential for engaging a broader range of stakeholders and instilling a sense of communal responsibility for environmental conservation. Using digital tools for dispute resolution can lead to sustainable and inclusive solutions, promoting a harmonious relationship between humans and the environment throughout time[97].

Digitalization of Environmental Dispute Resolution:

Use of technology in streamlining environmental dispute resolution processes:

In today's world, using technology to streamline environmental dispute resolution processes has proven to be a game changer, altering how conflicts are resolved promptly and effectively. Using tools such as online mediation platforms and virtual reality simulations, parties concerned can engage in collaborative problem-solving from the comfort of their own homes, saving the time and expenses associated with traditional techniques. Furthermore, the use of artificial intelligence to analyze massive volumes of data has resulted in more informed decision-making and sustainable

[96] Brown, L. (2019). The Role of Technology in Environmental Dispute Resolution. Environmental Law Journal, 43(2), 245-265.

[97] Smith, J., & Johnson, K. (2020). Digital Solutions for Environmental Conflict Resolution. Journal of Sustainable Development, 25(4), 78-94.

outcomes. The Environmental Law Institute found that technological improvements have improved communication and understanding among stakeholders, resulting in more peaceful solutions to complicated environmental problems.[98]

Benefits of digitilization in increasing efficiency and accessibility:

Integrating digital tools and technologies allows professionals in this industry to expedite procedures, improve data management and analysis, and facilitate communication among stakeholders, resulting in faster and more effective solutions to environmental concerns.[99] Furthermore, digitization allows for remote access to information and services, expanding their reach to a wider audience. Embracing digital transformation in Environmental Dispute Resolution not only boosts productivity but also improves accessibility, resulting in more sustainable and effective solutions to environmental concerns.

Challenges posed by cyber security concerns:

The growing digitization of environmental dispute resolution has highlighted various issues faced by cyber security concerns in today's interconnected society. Cyberspace has become a primary battleground for both state and non-state actors, making it critical for enterprises to maintain strong protection of their digital assets and sensitive data.

With the proliferation of online platforms for resolving environmental issues, there is an increasing need for robust security measures to protect the integrity of data, communications, and processes. This includes encryption technologies, security assessments on a regular basis, and cyber threat and best practice training for employees.

Furthermore, the trans boundary character of environmental issues adds to the complexity of cyber security difficulties, since coordination and safe information transmission between several parties in various geographical areas become critical.

[98] Jones, A. (2021). Leveraging Technology in Environmental Dispute Resolution. Environmental Law Institute, 25(2), 45-68.

[99] Smith, J. (2021). Leveraging Technology for Environmental Dispute Resolution. Journal of Environmental Law and Policy, 25(2), 145-162.

Organizations engaging in digital environmental dispute resolution must also be wary of increasingly sophisticated cyber threats such as ransom ware, phishing, and data breaches, which can jeopardize critical data while also eroding stakeholder trust.

To address these issues efficiently, a multifaceted approach that combines technical solutions, tough policies, and regular monitoring is required. Prioritizing cyber security in digital Environmental Dispute Resolution ensures confidentiality, integrity, and availability of important information, creating a safe and secure environment for all stakeholders[100].

The Role of Technology in Environmental Dispute Resolution:

Overview of technological tools used in environmental dispute resolution:

Technological tools aid in environmental dispute resolution by improving communication, collaboration, and decision-making [101]. These tools include Geographic Information Systems (GIS) for mapping and analyzing environmental data, as well as online dispute resolution platforms that facilitate stakeholder contact. Integrating technology such as remote sensing, data visualization software, and virtual reality improves the efficiency of settling environmental issues while also promoting transparency and involvement among parties involved[102]. Predictive analytic can forecast environmental conflicts and provide proactive remedies, thanks to advancements in AI and machine learning[103]. The application of these technical techniques in environmental dispute resolution represents a change toward a more data-driven and sustainable approach to resolving complicated environmental problems.

Impact of technology on the transparency and accountability of the process:

Technology plays an important role in increasing process openness and accountability, particularly in environmental dispute resolution. Stakeholders can use technology to obtain real-time data, track progress, and ensure a more transparent and equitable decision-making process. Technology

[100] Smith, J. (2021). Addressing Cyber Security Concerns in Digital Environmental Dispute Resolution. Journal of Environmental Law & Technology, 20(3), 112-127.
[101] Smith, J., & Brown, A. (2020). Environmental Dispute Resolution: Leveraging Technological Tools for Effective Solutions. Journal of Environmental Law, 15(2), 45-60.
[102] Green, M., & Jones, R. (2019). The Impact of Technological Tools on Environmental Dispute Resolution. Environmental Science Today, 7(4), 78-91.
[103] Chen, L., & Wang, Q. (2018). Leveraging Artificial Intelligence for Predictive Analytics in Environmental Dispute Resolution. AI & Environment Journal, 12(3), 112-125.

provides instruments for a more open and accountable process, ranging from online platforms that allow public input to smart algorithms that analyze large data sets. Furthermore, by automating specific processes and expediting communication, technology can lessen the possibility of human mistake and prejudice in decision-making. According to Smith et al. (2021), the use of technology in environmental dispute resolution processes has increased efficiency, credibility, and stakeholder engagement, resulting in better transparency and accountability. Finally, leveraging technology in environmental conflict resolution can result in more informed judgments, enhanced stakeholder trust, and, ultimately, better outcomes for environmental protection and sustainability[104].

Potential for improving the speed and accuracy of resolution:

Leveraging technology is crucial for improving the speed and accuracy of resolving environmental disputes. The use of tools such as Geographic Information Systems (GIS), artificial intelligence, and internet platforms can speed up the collecting and analysis of large volumes of data, allowing for the discovery of major issues and potential solutions. Using technology, stakeholders may collaborate in real time, resulting in faster decision-making processes and more accurate outputs. Automated systems can help organize information and track resolution progress, enabling systematic and transparent record-keeping. In essence, the use of technology in environmental dispute resolution not only speeds up the resolution process but also improves the precision of the results, which benefits all parties concerned.

Case study :

The National Green Tribunal (NGT) in India has been pivotal in resolving environmental disputes since its establishment in 2010. Its effectiveness can be assessed through several key case laws and outcomes:

1. Subhash Kumar vs. State of Bihar (2011)[105] : This landmark case emphasized the polluter pays principle and highlighted the NGT's role in holding industries accountable for environmental damage.

[104] Smith, J., Johnson, R., & Brown, L. (2021). The Impact of Technology on Environmental Dispute Resolution. Environmental Science Journal, 43(5), 789-802.

[105] 1991 AIR 420, 1991 SCR (1) 5, 1991 SCC (1) 598

2. Virender Gaur vs. State of Haryana (2012)[106]: NGT intervened to prevent illegal mining in Haryana, showcasing its proactive stance in halting environmentally harmful activities.

3. M.C. Mehta vs. Union of India (2016)[107] : NGT's orders regarding air pollution in Delhi resulted in significant measures to curb vehicular emissions, including the implementation of the odd-even scheme.

Challenges and Considerations:

Certainly, as we traverse the realm of digitization in environmental dispute resolution, we must address a number of obstacles and considerations.

Cybersecurity risks: The digitization of environmental dispute settlement systems raises substantial cyber security risks. Protecting sensitive information from data breaches and cyber-attacks is crucial in today's digital age[108]. Stakeholders must guarantee that strong cybersecurity measures are put in place to secure confidential data and keep dispute resolution mechanisms functioning properly.

Accessibility Issues: It is critical to address the issue of accessibility for stakeholders with limited technological capabilities. As we embrace digital venues for resolving environmental conflicts, there is a risk of excluding individuals or communities that may lack access to suitable technology or internet connectivity[109].

Providing different options of participation can help to reduce disparities and increase inclusion in decision-making.

Potential Bias or Manipulation: Another important aspect is the possibility of bias or manipulation in digital systems. Digital dispute resolution solutions may perpetuate biases or allow for outcome manipulation through automation and algorithms[110]. As a result, checks and balances, transparency

[106] Virendra Gaur v State of Haryana, (2012) **2 SCC 577** (Supreme Court of India, 1994)

[107] AIRONLINE 2016 SC 745, AIRONLINE 2015 SC 186

[108] Smith, J. (2021). Cyber Security in Digital Environmental Dispute Resolution. Environmental Law Journal, 45(2), 67-81.

[109] Johnson, A. (2020). Bridging the Digital Divide: Ensuring Access for All Stakeholders in Environmental Dispute Resolution. Journal of Environmental Ethics, 30(4), 112-126.

[110] Brown, L. (2019). Addressing Bias and Manipulation Risks in Digital Dispute Resolution Processes. Journal of Environmental Law and Policy, 12(3), 45-58.

measures, and algorithmic auditing are critical for reducing the possibility of unfair practices and maintaining the integrity of the settlement process.

To summarize, while we embrace the digital revolution of environmental conflict resolution, it is critical to address cyber security concerns, maintain accessibility for all stakeholders, and eliminate potential biases or manipulations in digital procedures.

By recognizing and addressing these issues and considerations, stakeholders can help to create a more inclusive, secure, and transparent environment for resolving environmental conflicts.

CONCLUSION

In conclusion, the digitization of environmental dispute resolution, notably through the lens of India's National Green Tribunal, has revealed both significant benefits and inherent problems. By embracing technology, the tribunal has reduced operations, boosted efficiency, and improved accessible for stakeholders across the country. The use of technical tools has not only increased transparency and accountability, but it also offers the potential to speed up the resolution process while maintaining accuracy. However, as with any digital change, cyber security issues loom large, jeopardizing the integrity of conflict resolution processes. Furthermore, accessibility challenges continue for stakeholders in distant places with inadequate technology resources, emphasizing the significance of closing the digital divide.

There is also legitimate worry about the possibility of prejudice or manipulation in digital systems, underlining the need for strong protections and ethical principles in the field of environmental dispute resolution. As we negotiate the expansion of technology in this domain, it is critical to find a delicate balance between utilizing the benefits of digitalization and avoiding its associated hazards in order to maintain fair, efficient, and accessible environmental dispute resolution for everyone.

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ARTICLE NO. 6

INTERPLAY BETWEEN IPR & GREEN TECHNOLOGY: A COMPARATIVE ANALYSIS

ABSTRACT:

Climate change has been a major global issue for the past few decades. Green Technology and innovations have developed drastically to mitigate the adverse effects of climate change and aid ecological sustainability. Intellectual Property refers to the property (tangible/intangible) that is created by the use of one's cognitive abilities. Due to the exponential growth in green technology and the renewable energy sector, IPRs have become important to protect these green innovations. This paper delves into the interplay between green technology, IPRs, and ecological sustainability. The paper examines the Indian framework for IPRs of green innovations. Further, a comparison has been made to countries with strong green IPR models like the USA, and the UK by exploring their respective frameworks. The research aims to bring out the loopholes in the Indian green IPR regime with the aid of this comparative study. The research findings have been used to suggest improving India's IPR framework in green technology to encourage greater innovation in the sector.

KEYWORDS: *WIPO, IPRs, Green Technology, Sustainability, Patents, Green channels, UKIPO, USPTO, Compulsory Licensing.*

INTRODUCTION:

Any form of energy produced from renewable natural resources, including sunshine, wind, or water, is referred to as green energy. Though there are various distinctions between green and renewable energy, it often originates from renewable energy sources. Since green energy substitutes more ecologically favorable options for the harmful consequences of fossil fuels, it is crucial for the environment. Green energy comes from natural resources and is frequently renewable and clean, which means it produces little to no greenhouse gas emissions and is easily accessible.[111] These energy sources have gained relevance rapidly in recent times owing to the environmental crisis and mitigation of the same. Intellectual property rights are primarily intended to ensure that creators and innovators are paid for their efforts and for sharing their technological know-how with the public, thereby encouraging increased innovation and creativity. This encourages the development of fresh ideas, innovations, and enhancements that everyone may later make. The global energy sector can transition to renewable energy sources because of technological advancements and the global hunt for sustainable alternatives. As the energy transition picks up steam, intellectual property (IP) rights that support technological advancements and improvements made to rival technologies will become increasingly crucial. In addition, as businesses focus on creating new products and services for this emerging green market, we are seeing an inevitable increase in the need for protection.[112] This paper focuses on how IPRs can be amended to promote green technologies and takes inspiration from leading countries to suggest changes in the Indian Green IPR regime.

GLOBAL MEASURES TO PROMOTE GREEN IP:

WIPO is significantly contributing to the acceleration of Green IP. "WIPO GREEN is an online technology exchange marketplace bringing together producers and consumers of eco-friendly technology to facilitate international efforts to combat climate change. In both affluent and

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[111] *What is Green Energy? (Definition, Types and Examples)*. (2018). Twi-Global.com. https://www.twi-global.com/technical-knowledge/faqs/what-is-green-energy#WhyGreenEnergyIsImportant

[112] *The green side of intellectual property and its role in energy transition innovation*. (2022). Dentons.com. https://www.dentons.com/en/insights/articles/2022/june/15/the-green-side-of-intellectual-property-and-its-role-in-energy-transition-innovation

developing nations, WIPO GREEN Acceleration Projects have promoted innovation in sustainable agriculture, waste management, and renewable energy to meet global environmental concerns., coupled with the release of the 'Green Technology Book' for guidance and IP Management Clinic for road mapping.[113] It is a technology marketplace established by WIPO to accelerate the acceptance, adaption, and deployment of environmental solutions, especially in developing and impoverished nations. An accomplishment for the Indian green industries is the *inclusion by WIPO Green of the Bhungroo technology—created by Biplab Ketan Paul and Trupti Jain—in the Green Technology Book.* By storing surplus rainfall underground, preventing floods and droughts, empowering women farmers, and promoting sustainable development in rural areas, this technique transforms agriculture. The goal of the WIPO GREEN project is to improve the application of green technologies worldwide, especially in developing nations, by promoting package technology license agreements. Their main objective is to create a worldwide network that fosters connections with businesses committed to providing a package that comprises essential components such as patent licensing, trade secrets, technical documentation, training programs, etc. Article 7 of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) appreciates IP rights by stating: "The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations."[114] There are a few programs aimed at improving and protecting Green IP :

1. IPC Green Inventory

WIPO launched an effort on September 16, 2010, in the form of an online portal linked to the International Patent Classification (IPC) system that streamlines patent searches for environmentally friendly technology (ESTs). The following technological categories are included in the IPC Green Inventory: Alternative Energy Production, Energy Conservation, Nuclear Power

[113] *WIPO GREEN: The Global Marketplace for Sustainable Technology*. (2023). Wipo. int. https://www3.wipo.int/wipogreen/en/

[114] Trade-Related Aspects of Intellectual Property Rights 1994, art 7

Generation; Transportation, Waste Management, Agriculture Forestry, Administrative, Regulatory, and Design Aspects.[115]

2. Clean Energy Research Centre

They were initiated in 2009 by the United States and China to allow cooperation research and development of sustainable energy technology by specialized teams of researchers, scientists, and engineers from both nations. A US-China Renewable Energy Forum has also been created to enhance collaboration on intellectual property issues connected to renewable energy[116].

3. The Eco-Patent Commons

Important global companies including Sony, IBM, Nokia, and others joined forces with the World Business Council for Sustainable Development (WBCSD) in February 2008 to develop a cutting-edge green community. The purpose of this group is to share patents and knowledge on environmental issues, energy efficiency, preventing pollution, recycling, and water conservation. All participating organizations and outside parties are welcome to join this community, and access to the protected technology doesn't require registration or notification. For instance, Nokia gave the public a patent on recycling cell phones. This patent is accessible to third parties without the need to pay a royalty fee through "The Eco-Patent Commons." Currently, the commons did not increase the diffusion of pledged inventions, and the Eco P.C. suffered from several structural and organizational issues.[117]

INDIAN INITIATIVES TOWARDS GREEN IP

India is starting to gain international recognition as a significant source of investments in renewable/green energy. This is due to two reasons; Firstly, India's commitment to become carbon-neutral till 2070, and secondly due to its varied topography which allows the industries to

[115]*Green Innovation Protected: India's Copyright & IP Frameworks*. (2024, January 24). De Penning and de Penning. https://depenning.com/blog/copyright-green-inventions/?utm_source=mondaq&utm_medium=syndication&utm_content=articleoriginal&utm_campaign=article)
[116]Prasad, G. (2024). *Green Intellectual Property- A Step towards Sustainability*. Legaleech.com. https://www.legaleech.com/blogs/green-intellectual-property-a-step-towards-sustainability
[117] taxguru_in, & anandamlegals. (2020, June 3). *Green IP – The way forward to sustainability*. TaxGuru. https://taxguru.in/corporate-law/green-ip-sustainability.html#google_vignette

harness various sorts of green energies in the same country. [118]Not only are significant financial investments being made in India's green energy infrastructure, but expertise is also being shared. Numerous nations have started talking to India about forming green relationships or have already begun engaging with it.

India and Denmark established the Green Strategic Partnership in 2020 to collaborate on environment-friendly solutions to developmental challenges[119]. India has developed specialized sectors and expertise, making it advantageous in the "green marathon." India now has the third-place position in Asia for low-carbon environmental goods and services (LCEGS) sales. The nation has committed to sustainable energy development by planning massive green energy projects. This includes large-scale solar and wind power ventures.[120] About 13 percent of India's high-value patents are related to green tech, which is in line with the world average. In 2013, India successfully filed 1,140 high-value green patents. Recently India has seen a surge in green patenting and providing IP protection to such innovations. In 2017, it gave out 2,505 green patents[121]. But compared to the US, Japan, and South Korea—nearly 60% of all green tech patents worldwide are held by these three longstanding innovators—the nation appears to be lagging. *According to data from the Indian Ministry of Commerce and Industry, the country might have recorded more than 60,000 green patents by the year 2022.* Production of alternative energy and waste management are the subjects of 90% of green patents. The rest of the green technology patents are for energy conservation, transportation technologies, agriculture and forestry, and others.[122] Between 2016 and 2021, India granted every second patent related to green tech, demonstrating the industry's commitment to sustainability. Over 61,000 green tech patents were filed, with 63% covering waste management, 26% covering alternative energy production, and the

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[118] *India is committed to achieve the Net Zero emissions target by 2070 as announced by PM Modi, says Dr. Jitendra Singh*. (2023). Pib.gov.in. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1961797

[119] *India and Denmark: Energy – a strategic green partnership with global potential*. (2024, May 16). State of Green. https://stateofgreen.com/en/publications/india-and-denmark-energy-a-strategic-green-partnership-with-global-potential/

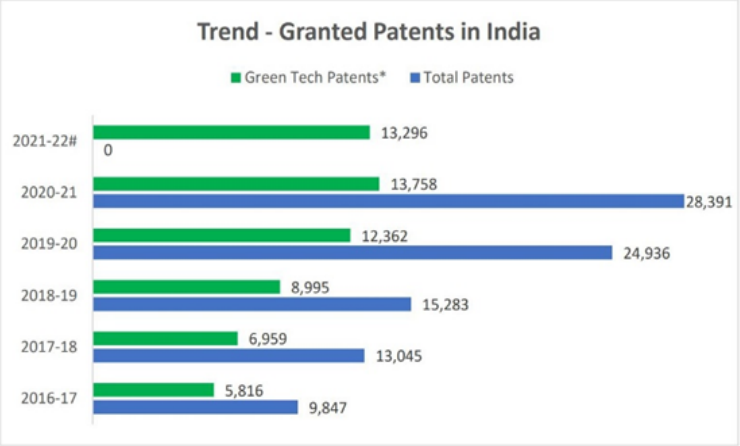
[120] Barnabas, A. (2024, February 5). *Green Innovation And IP: Legal Frameworks for Sustainable Technologies in India.* Mondaq.com; De Penning & De Penning. https://www.mondaq.com/india/patent/1419990/green-innovation-and-ip-legal-frameworks-for-sustainable-technologies-in-india

[121] *Ibid*

[122] Rao, R. R. (2023, May 2). *Accelerating the Future: The Rise of Green Technology and Intellectual Property Rights*- An overview of glob... Lexology; K&S Partners. https://www.lexology.com/library/detail.aspx?g=3c268d28-aed7-475a-b3d8-85341bf78787

rest covering energy conservation, transportation technologies, nuclear power generation, agriculture, and forestry.[123]

Rahul Podaar founded *Enviro Recyclean Private Limited*, a firm with headquarters in Mumbai, in 2020. Recently, their patent application for a "Compact Integrated System for Generation of Renewable Green Energy" was published in a patent publication in December 2023. The invention primarily pertains to a system that generates green energy from renewable resources and offers an easy way to efficiently use such resources. *Imagine Power Tree*, a company started by Shani Pandya, is another instance of a patent that has been awarded and turned into a business. This Gandhinagar, Gujarat-based sustainable technology innovation firm was backed by the Industries Commissionerate (IC) Department of the Government of Gujarat under the Start-up/Innovation Scheme. The company was first incubated at Pandit Deendayal Petroleum University.



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As the aforementioned facts show, India does have green technology, but the intellectual property rights structure that supports and encourages innovation in this area is severely out-of-date. With several laws and regulations designed to safeguard and uphold these rights, India has a comprehensive legal framework controlling intellectual property rights. The government has also ratified several international treaties and accords about intellectual property rights, including the Convention on Biological Diversity (CBD) and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). The World Trade Organization (WTO) agreement includes TRIPS, which lays out the minimal requirements for the defense and upholding of intellectual

[123] *LinkedIn.* (2024). Linkedin.com. https://www.linkedin.com/pulse/impact-intellectual-property-developing-green-ashish-sonawane/
[124] Supra Note 10.

property rights (IPR) of participating nations. India has incorporated the TRIPS agreement into its laws and policies. This demonstrates its commitment to promoting innovation and protecting traditional knowledge and heritage. *However, currently, India has not set up any specific policy to facilitate the patenting of green technology.* The same process that applies to other patent applications needs to be followed for innovations in the fields of waste management and renewable energy. This can result in protracted waiting periods and increased costs due to the need to pay official fees and associated attorney fees, as well as lost opportunities for businesses that are unable or unwilling to fully utilize their inventions' commercial potential until the patent has been granted. Furthermore, many smaller firms are discouraged from pursuing patenting entirely by the formal fees alone, which deters them and makes them less competitive which results in a large base of the innovation world from prioritizing research in these fields.[125]

ANALYSIS OF THE EXISTING INDIAN IPR REGIME

Patents can play a positive role in green innovation by encouraging inventors to disclose their inventions, which can stimulate further research and development, and by allowing inventors to license or sell their patents, which can generate revenue and facilitate technology transfer. However, patents can also work against green innovation by making it harder for low-income and developing nations to obtain necessary technology and by raising the possibility of patent disputes and litigation, which can waste money and impede cooperation. The current patent system has a bias against environmental sustainability since it is primarily oriented towards the intellectual property rights sectors, which advocate for more patent protection. Because of the current patent system, there is a rush to develop cutting-edge technologies purely for financial gain. The impact that technology has on the environment is ignored. By praising technical proficiency and expertise, the same method may be deemed ecologically sound and contribute to sustainable development. The curious yet viable compromise between economic growth and the security of the environment can be reached through patents.[126]

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[125] *Green patents: time for India to introduce them?* (2021, November 18). IP Helpdesk. https://intellectual-property-helpdesk.ec.europa.eu/news-events/news/green-patents-time-india-introduce-them-2021-11-18_en

[126] Team, I. (2020, June 8). *Green Patents - Can Patents Help Save The Environment?* | Intepat IP. Intepat IP. https://www.intepat.com/blog/green-patents-environments/#:~:text=Green%20Patents%20and%20the%20Law,development%20needs%20to%20be%20streamlined.&text=This%20allows%20other%20countries%20also,and%20environmental%20protection%20a%20reality

To address these issues, India has adopted several measures in its patent law and policy:

1. "Excluding certain subject matters from patentability, such as plants, animals, traditional knowledge, and methods of agriculture or horticulture – disclosed in section 3 of the Indian Patent Act 1970.[127]"
2. Providing compulsory licensing provisions that allow the government or a third party to use a patented invention without the consent of the patent holder under certain circumstances, such as public health emergencies or non-working of the patent.
3. "Establishing patent pools that allow multiple patent holders to share their patents under a common agreement, which can reduce transaction costs and increase access to technologies."
4. "Providing incentives for green patent applicants, such as expedited examination and reduced fees."

Intellectual property rights such as **copyrights and designs** safeguard the way ideas are expressed as well as the attractive qualities of goods. By enabling authors and designers to safeguard their unique creations and goods, copyrights and designs may promote green innovation and boost their income and notoriety. However, restricting access to and reuse of previously created works and goods, copyrights and designs can also pose problems for green innovation. This can impede the spread and use of green innovations. *To address these issues, India has taken some steps in its copyright and design law and policy:*

1. "Protecting computer programs that enable the creation, operation, and improvement of green technologies."
2. "Protecting integrated circuits that are essential for the functioning of electronic devices and systems."
3. "Protecting layout designs of integrated circuits that are the result of intellectual effort and are not commonplace."
4. "Protecting databases that are collections of independent works or data arranged systematically or methodically."

[127] Indian Patent Act 1970, s 3

5. Protecting sui generis works that do not fall under any of the existing categories of works, such as AI-generated works.[128]

The analysis of the Indian Green IPRs framework reveals various lacunas along with the fact that no targeted strategies have been implemented to exponentially boost Green IPRs. This is a wake-up call given India's environmental commitments. The comparative study that follows builds a suitable way ahead for India to proceed in the Green IPR regime.

UK'S INITIATIVES TO CATER TO GREEN IPRs

The UK government released its ten-point plan to tackle climate change and mitigate the ecological disadvantages by 2050. Green technologies are already a bustling industry; between 2000 and 2020, UK patent registrations in this field increased by 400%. The UK now holds the top spot globally for offshore wind and green building patents, and it has established itself as a pioneer in the fields of wind, nuclear, electric vehicles, and carbon capture technologies. According to the IPO study, innovation must pick up speed for the UK sector to stay up with both competing green-transitioning markets outside and domestic sustainability forecasts. As a result, patent protection in the green technology industries is probably going to become more and more crucial, both for inventors competing for lucrative positions and for the government, which is trying to encourage UK businesses to stick to its sustainability targets.[129]

The Intellectual Property Office UK (IPO UK) aims to establish the ideal conditions for corporations, inventors, and entrepreneurs to feel empowered to develop and finance environmentally friendly technology. As a result of the "Green Channel" that green patents have created, patent applications that assist the environment can be expedited and filed in as little as nine months. It has handled over 4,000 patent applications, and the number of applications grows yearly. [130] The Green Channel is open to all sorts of green patent applications. Applicants for

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[128] *GREEN INNOVATION AND INTELLECTUAL PROPERTY RIGHTS - SURANA & SURANA. (2024, February 19). SURANA & SURANA* - International Attorneys. https://suranaandsurana.com/green-innovation-and-intellectual-property-rights/

[129] Calem Curreen. (2024, May 8). *Channelling Innovation In Green Tech: UK IPO Report Spotlights Industry Leaders*. Mondaq.com; Potter Clarkson. https://www.mondaq.com/uk/patent/1460912/channelling-innovation-in-green-tech-uk-ipo-report-spotlights-industry-leaders

[130] *Intellectual Property Office UK's initiatives to support the delivery of the UN's Sustainable Development Goals| FICPI.* (2024, April 26). Ficpi.org. https://ficpi.org/ip-news/world-ip-day-2024-IPO-uks-initiatives-support-sustainability.

patents must submit a written application that includes a plausible claim that the innovation benefits the environment and the precise phases in the granting process (search, examination, etc.) that they would like accelerated. Unjustified applications, however, shall be rejected. In the case of the ***United Kingdom Intellectual Property Office v. Harrison (2017)***[131]**,** the UK intellectual property workplace ruled against an employer that attempted to register a trademark for "Eco-friendly" merchandise as the declaration was considered too indistinct and unsubstantiated.

An applicant might gain from having their application approved more quickly in a variety of ways. Inventions can be commercialized more quickly with a faster grant, and smaller companies may find it more appealing to recruit investors with a granted patent than one that is still waiting. In a similar vein, licensees could feel safer if their license is for an issued patent as opposed to one that is still ongoing. Applicants may choose to pursue protection in the UK first to take advantage of the Green Channel if they want to use the Patent Prosecution Highway (PPH) to get protection in several jurisdictions. To speed the prosecution of patent applications even further, the Green Channel can be used in conjunction with other unofficial means of accelerating prosecution, such as rapidly responding to correspondence from the UKIPO.[132]IP applications and registrations that are registered in the UK are publicly available, cost-free, or need very little money to view. Since patents provide specifics about the underlying inventions, publication is especially beneficial in these cases. When a patent is filed, the applicant grants the world access to their idea in return for a 20-year monopoly. Although the process's temporary monopoly may be seen negatively, others will eventually be able to use and develop such intellectual property (IP) because of the transparent nature of the register and the requirement to disclose in the patent claims how the invention functions. This can happen either through licensing or when the patent expires.[133] In addition to providing early access to the UK's Patent Box system, accelerating patent grants to green technologies also offer tax reductions on income from patented goods and technologies. UK lawmakers hope that the UK's push towards net zero by 2050 is fueled by increased acceptance and awareness of the Green Channel, in addition to parallel projects, schemes, and grants. The purpose of the Patent Box is to promote intellectual property ownership and commercialization

[131] Office, P. (2006). Intellectual Property Office - Decisions. *Ipo.gov.uk*. http://www.ipo.gov.uk/

[132] HLK. (2021, June 21). *The UKIPO Green Channel*. Mondaq.com; HLK. https://www.mondaq.com/uk/patent/1080920/the-ukipo-green-channel

[133] Hitchens, B., Heard, C., & Vertes, J. (2024). Sustainability and Intellectual Property in the United Kingdom. *LIDC Contributions on Antitrust Law, Intellectual Property and Unfair Competition*, 387–415. https://doi.org/10.1007/978-3-031-44869-0_21

among UK enterprises. It enables businesses to tax earnings from their patented inventions at a reduced corporation tax rate. Companies who wish to use the 10% reduced corporation tax rate must elect to use the Patent Box. The phased introduction of this alleviation took place between 2013 and 2017.[134]

Designs that are registered in the UK safeguard a product's overall or partial look that arises from the product's lines or forms, colors, form, texture, or material, as well as any embellishments added to it. Any industrial or handcrafted item, including components meant to be combined into a complicated product, is referred to as a "product." Currently, design rights are important to sustainability since they can be used to protect "green" products or aspects of them. sections that serve a strictly technical purpose yet allow for some degree of design freedom are not protected, even though sections made up entirely of technical features are. The UK Intellectual Property Office held a "Call for Views" survey in January 2022 regarding the revision of the UK design framework. Stakeholders in the design industry and IP experts were invited to submit ideas for potential enhancements to the current system. To support the right-to-repair agenda and prolong product life, the UKIPO recommended during that consultation to expand the spare parts exemption to further unregistered designs. The UKIPO particularly cited the UK government's pledge to achieve net zero by 2050 as a basis for their proposal.[135] Intelligent Energy is a top fuel cell engineering company in the UK with an emphasis on creating lightweight, highly efficient fuel cell technology. They are merely one of the businesses that have utilized the expedited patent application process offered by IPO's Green Channel. Their expertise in the creation and production of fuel cells with no emissions spans over two decades. Numerous sectors, including automotive, stationary power, aerospace, materials handling, and unmanned aerial vehicles (UAVs), rely on these systems to supply power for various applications.[136] The UK has globally worked with WIPO to promote green technologies and capacity-building programs to strengthen its green IP frameworks. Additionally, it has collaborated with EPO Observatory on Patents and Technologies to work on green technologies. These measures have led to the drastic expansion in green patent

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[134] HM Revenue & Customs. (2007). *Use the Patent Box to reduce your Corporation Tax on profits*. GOV.UK; GOV.UK. https://www.gov.uk/guidance/corporation-tax-the-patent-box

[135] GOV.UK – Net Zero Strategy: Build Back Greener, available at https://www.gov.uk/government/publications/net-zero-strategy. Accessed 19 November 2022.

[136] Percival, I. (2022, June 6). *Intelligent Energy: using the IPO Green Channel to accelerate environment-friendly patents – Intellectual Property Office blog*. Blog.gov.uk. https://ipo.blog.gov.uk/2022/06/06/intelligent-energy-using-the-ipo-green-channel-to-accelerate-environment-friendly-patents/

registration in the UK as they foster cooperation among stakeholders and give legitimate security to innovators at the same time.

USA'S INITIATIVES TO CATER TO GREEN IPRs

The United States is simultaneously pursuing multiple climate mitigation goals. Each goal serves as an important milestone toward rapidly reducing our GHG emissions to net zero. The National Climate Strategy (NCS) of the United States outlines a comprehensive policy strategy that is now being implemented, encompassing all facets of federal action, in support of endeavors conducted by the entire population. The U.S. Long-Term Policy (LTS) report represents the overarching U.S. climate policy, which was informed by consultations with a variety of stakeholders conducted by the Biden Administration. A broad spectrum of stakeholders was included in this engagement, including large unions that advocate for millions of American workers, organizations that represent tens of millions of advocates, and young Americans. Several specialized researchers focusing on pollution reduction issues, as well as groups representing scientists, corporations, higher education institutions, and political figures such as mayors and governors, were involved in the development of this strategy.[137] The procedure of obtaining patents for green innovations has grown more collaborative in recent years due to the rise in partners. The nations that suit this example include the USA, Germany, and Japan. Five percent of all green technology patent applications come from universities. With the notable exception of biotechnology, where institutions account for 23% of patent applications, this percentage is comparable to the norm for other technologies.[138]

In 2022, the United States Patent and Trademark Office (USPTO) joined WIPO Green, the World Intellectual Property Organization's global platform for green technology, as a technology partner. According to Kathi Vidal, Under Secretary of Commerce for Intellectual Property and Director of the USPTO, "the USPTO joins the effort to help companies, communities, and individuals from around the world identify innovative green technologies and who is producing and selling them by becoming a WIPO GREEN partner." [139] The USPTO introduced the Climate Change Mitigation Pilot Program in 2022 as a replacement for the Green Technology Pilot Program. Its goal is to

[137] https://www.whitehouse.gov/wp-content/uploads/2021/10/us-long-term-strategy.pdf.
[138] *32.1 Green patents in regions*. (n.d.). https://doi.org/10.1787/888932439976
[139] *USPTO becomes a partner in the international green-technology platform, WIPO GREEN*. (2022, July 21). Uspto.gov. https://www.uspto.gov/about-us/news-updates/uspto-becomes-partner-international-green-technology-platform-wipo-green-0

improve the climate by expediting the review of patent applications for ideas that reduce climate change. The USPTO broadened the qualifying criteria to cover additional technologies that will advance the objective of net-zero greenhouse gas emissions. To expedite a first-office action, which is a written notice of findings for the patent application by a patent examiner, qualifying applications involving technologies that reduce, remove, prevent, and/or monitor greenhouse gas emissions, will be advanced under the expanded program. To be eligible for this program, an applicant must timely file a petition to make a special using the necessary petition form. Applications that meet the eligibility conditions are exempt from petition fees and do not need the applicant to fulfill any additional requirements of the accelerated examination program.[140] The United States Patent and Trademark Office (USPTO) honors inventors who apply ground-breaking technology to address global humanitarian concerns through its Patents for Humanity awards program. Businesses that participate in the program are given incentives to cater to the needs of the general public. The winners get public acknowledgment for their efforts and an acceleration certificate that speeds up certain USPTO processes. The awards highlight the creative ways that forward-thinking patent holders are paving the road to offer the less fortunate scalable, inexpensive, and long-lasting solutions. Applications to Patents for Humanity are assessed based on how well their technology solves humanitarian problems, how much the applicants have done to encourage the poor to utilize their technology, and how much of an improvement in lives their efforts have produced.[141] This category is especially rewarding for green technologies that mitigate humanitarian crises caused by the side effects of pollution and greenhouse gas emissions. The USPTO has added a new category to the Patents for Humanity Awards Programme specifically for people who are creating green energy sources quickly utilizing innovative technology in response to the difficulties posed by climate change. This new prize category offers financial incentives to patent applicants, holders, and licensees whose innovations use renewable energy sources—such as wind, solar, geothermal, hydropower, green hydrogen, and biofuel—to combat climate change.[142] All patent owners, applicants, and licensees are eligible to compete; this includes inventors who haven't given up their ownership rights, assignees, and exclusive or non-

[140] *Climate Change Mitigation Pilot Program*. (2022). Uspto.gov. https://www.uspto.gov/patents/laws/patent-related-notices/climate-change-mitigation-pilot-program

[141] *Patents for Humanity*. (2020). Uspto.gov. https://www.uspto.gov/ip-policy/patent-policy/patents-humanity

[142] *Patents for Humanity: Green Energy*. (2023). Uspto.gov. https://www.uspto.gov/ip-policy/patents-humanity-green-energy

exclusive licensees. Every program application must include technology related to green energy that is the focus of one or more claims in a utility patent application that is pending or already granted in the United States and that the applicant owns or licenses. As an alternative, a green energy technology application may make use of the US utility patent or a US utility patent application that is currently pending. The following six technological fields are examples of program applications, but they are not the only ones: geothermal, hydropower, wind, solar, hydrogen, and biofuels. [143]

The Department of Commerce office (USPTO) and the National Oceanic and Atmospheric Administration (NOAA) have established a partnership to foster and accelerate more innovation in these fields. A work-sharing program that focuses on the nexus between intellectual property (IP) and climate and environmental technologies is the foundation of the partnership. Through the program, which involves exchanging staff for up to a year, the agencies will be able to work together more effectively and support each other's efforts to encourage more innovation in these vital areas. USPTO patent examiners examining patent applications about environmental and climatic technology will get training from NOAA specialists, who will additionally counsel the agency on USPTO green programs.[144] The role that patents play in advancing environmental technology is a crucial aspect of the relationship that exists between intellectual property rights and environmental sustainability. The United States Supreme Court ruled in the 1980 case of *Diamond v. Chakrabarty*[145], that patents would be granted for genetically modified organisms. This ruling has improved biotechnologies that have potential environmental benefits. Between 2005 and 2015, the Southern District of New York federal court and the Second Circuit Court of Appeals heard the copyright case ***Authors Guild v. Google***[146]. It dealt with fair use under copyright law and the scanning and digitalization of printed copyrighted books to create an online searchable database. The main topic of discussion was the legality of the 2003 launch of the Google Book Search (formerly known as Google Print) Library Partner initiative. Problems with environmental sustainability can also be impacted by copyright legislation, particularly when it comes to the use

[143] https://www.uspto.gov/sites/default/files/documents/Patents-for-Humanity-Green-Terms-and-Conditions.pdf
[144] *NOAA, U.S. Patent and Trademark Office create a work-sharing program to advance green technology*. (2023, February 28). Uspto.gov. https://www.uspto.gov/about-us/news-updates/noaa-us-patent-and-trademark-office-create-work-sharing-program-advance-green
[145] Diamond v. Chakrabarty, 447 U.S. 303 (1980)
[146] *Authors Guild v. Google, Inc., No. 13-4829 (2d Cir. 2015)*. (2015). Justia Law. https://law.justia.com/cases/federal/appellate-courts/ca2/13-4829/13-4829-2015-10-16.html

of protected materials in environmental campaigning or teaching. The public benefit of making books available was cited by the Second Circuit in supporting Google's use of copyrighted material in its Google Books initiative. The court also expressed favor as this initiative maintained ecological sustainability.

SUGGESTIONS AND FINDINGS:

After comparing the Greem IPR frameworks of India with international models we have recorded the following suggestions that Indian IPRs need to inculcate to ensure better prosecution of green applications demand IP protection.

- The Indian government should develop a national Green IPR strategy that integrates IPR protection into the country's overall sustainable/environmental development goals. This can help to ensure that IPR protection is aligned with India's broader development objectives and that it contributes to the country's long-term sustainable growth. This can be inspired by the USPTO and UKIPO offices which are dedicated in their functioning towards various facets of IPRs. This streamlines the laws of the country making it complication-free and fostering greater scope toward green innovation. Green Chanel is a perfect example of this suggestion.
- India like the UK, and USA, can start a program to accelerate the review applications of green technology, with an incentive to encourage people to come up with inventions for green technology. Law and science graduates should be mandatorily given green technology invention pilot projects to promote green patents and litigation in the field. This also means the compulsory inclusion of IPRs and environmental studies in the curriculums of law and engineering institutes.[147]
- The Indian government should promote public-private partnerships to encourage innovation and technology transfer in sustainable development. This can be achieved by creating a framework for collaboration between the public and private sectors, such as through joint R&D initiatives and technology transfer programs. The Indian regime must facilitate deeper cooperation between various stakeholders

[147] Rai, D. (2021, April 5). *Climate change and intellectual property rights - iPleaders*. IPleaders. https://blog.ipleaders.in/climate-change-and-intellectual-property-rights/#Green_technology_in_India

to promote training on green innovations and IPR protection of the same. The Indian IPR offices must take initiatives like the (USPTO) and the National Oceanic and Atmospheric Administration (NOAA) have established a partnership to foster and accelerate innovation.

- The Indian government should *foster international cooperation on Green IPR protection* and sustainable development by participating in international treaties and agreements. This can help to ensure that India's IPR regime is aligned with international standards and that the country benefits from global knowledge exchange and collaboration. [148] The Green Pact made between India and Denmark and the collaboration between USPTO and WIPO Green serves as a perfect example.
- *A Green Patent Box framework* may be included in the taxation regime of India to promote green intellectual property ownership and commercialization among Indian enterprises. It enables businesses to tax earnings from their patented inventions at a reduced corporation tax rate. Companies in the UK who wish to use the 10% reduced corporation tax rate must elect to use the Patent Box. This can be a great takeaway from the UK's IP regime to grow green innovation in India.
- *Creating social relevance and incentive* for innovation that promotes ecological sustainability can be a major reform that promotes green innovations and at the same time offers IPR protection. This can be inspired by the USPTO's new category of the Patents for Humanity Awards Programme specifically for people who are creating green energy sources quickly utilizing innovative technology in response to the difficulties posed by climate change. This new prize category offers financial incentives to patent applicants, holders, and licensees whose innovations use renewable energy sources. Introducing such incentives for Indian industries may give a huge boost to ecological sustainability.
- "*Compulsory licensing*" gives someone the authority to use a copyrighted innovation and pays the inventor a royalty without the inventor's consent. This idea,

[148] Divya Samriti. (2023). Role of IPR in Sustainable Development in India. *Social Science Research Network.* https://doi.org/10.2139/ssrn.4397580

which is essential to IPR law, was enacted by statute to grant access to patented innovations to third parties. Under some circumstances, such as in times of national emergency, extreme urgency, or public non-commercial uses, TRIPS allows compelled licensing (Article 31). The issues of climate change and environmental deterioration may justify the requirement of compulsory licensing for green technology. Although TRIPS is mute on the definition of a national emergency, member nations must establish the issue's urgency. One important weapon for ensuring the spread of green technology is compulsory licensing, especially in low-income nations where the cost of green technologies is prohibitive. This IPR reform can be enacted by India to ensure the diffusion of IPRs with green innovation and provide a sustainable future. The determination of whether a recipient country has adequate infrastructure for accommodating the technology is a critical factor in evaluating the appropriateness of compulsory licensing for green technology transfer.[149]

CONCLUSION:

Achieving ambitious environmental targets, such as zero carbon emissions, requires a global focus on green technologies. A key component of the adaptation plan is the creation and dissemination of climate-friendly technology. To address the problem of global climate change, new technologies are required. While it is premature to draw firm conclusions, it may not be overstated to say that developing countries ought to be cognizant of how green technologies and IPRRs intersect and should take proactive steps, such as technological evaluation, cooperation, and legislative changes, to create a safe system in which incentives and ecological sustainability coexist. India is not as far forward as other big nations in terms of encouraging green technology patenting through programs like incentives, faster examination, and reduced renewal fees. Policymakers, thinkers, and corporate bodies in India need to introduce measures to address climate change challenges.

[149] *Green is the New Black: Exploring Green Technology Patents as Corporate Initiatives for Environmental Innovation*. (2024, March 26). The IP Press. https://www.theippress.com/2024/03/26/green-is-the-new-black-exploring-green-technology-patents-as-corporate-initiatives-for-environmental-innovation/

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2. THE LONG-TERM STRATEGY OF THE UNITED STATES, https://www.whitehouse.gov/wp-content/uploads/2021/10/us-long-term-strategy.pdf

3. USPTO Patents for Humanity Program: Green Energy, https://www.uspto.gov/sites/default/files/documents/Patents-for-Humanity-Green-Terms-and-Conditions.pdf

4. Samriti, Divya, Role of IPR in Sustainable Development in India (March 23, 2023). Available at SSRN: https://ssrn.com/abstract=4397580 or http://dx.doi.org/10.2139/ssrn.4397580

5. Chu, Jonathan M. W. W. (2013). Developing and diffusing green technologies: the impact of intellectual property rights and their justification. Journal of Energy, Climate, and the Environment, 4(1), 53-102.

6. Srinivas, Krishna Ravi, Climate Change, Technology Transfer and Intellectual Property Rights (July 29, 2009). RIS Discussion Paper Series, RIS-DP #153 2009, Available at SSRN: https://ssrn.com/abstract=1440742 or http://dx.doi.org/10.2139/ssrn.1440742

7. Submitter, IPO, The race to net zero: Tracking the green industrial revolution through IP (February 26, 2024). Available at SSRN: https://ssrn.com/abstract=4738809 or http://dx.doi.org/10.2139/ssrn.4738809

8. Roadmap for a Role for Intellectual Property Offices in the Governance of Green Innovation, https://sdgs.un.org/documents/de-andrade-roadmap-role-intellectual-property-offices-effective-governance-green

ARTICLE NO- 7

Urban Planning in the Digital Age: Legal Mechanisms for Sustainable Smart Cities

ABSTRACT

Over time, technological advances have drastically changed the field of urban planning and the result is sustainable smart cities that provides for the community, first. The current research covers the legal measures needed to ease and regularize the introduction of Digital tools in the urban planning process. The study starts with defining the idea of smart cities, and underlines that technology plays a vital role in supporting sustainability, efficiency, and livability of a city. This underscores the need for a strong legal base that allows digitalization of urban infrastructures to ensure for environmental, data protection, and privacy policies. It highlights important legal challenges - facilitation of land use, with GPS data provided, ensuring that data governance is legal, protecting IP in the framework of smart city innovations. It will also look at the policy implications of digital urban planning - arguing that more transparent rules and standards have to be implemented to guide technology-induced innovation in all areas of urban development. The paper also comments on the role of public-private partnerships to advance the digitalisation of cities and the legal issues underpinning such cooperation. The research examines how the legal ecosystem can be developed to enable the transition to smart cities and captures best practices and necessary legal reforms from jurisdictions around the world. The study thus illustrates the crucial function of law in determining the trajectories of urban development, highlighting the need for a forward-looking and flexible legal instrument that can keep up with technological changes and harness smart urban innovation towards sustainable, resilient and inclusive smart cities. These results aim to provide to policymakers and urban planners, as well as legal experts feedback about the necessary legal instruments in order for urban planning to face the challenges and opportunities of the digital era.

Keywords: Smart cities, Digitalization, Urban planning, Legal frameworks, Sustainability

THE IDEA OF SMART CITIES

The idea of smart cities has been billed as a game changer in urbanisation, utilising the enabling power of technology to overcome the myriad urban challenges in the modern world. A smart city fundamentally, is an ecosystem/structure that combines digital infrastructure, data analytics, and advanced technologies to improve the quality of life, efficiency, and viability in the urban space. It does so through the full integration of information and communication technologies (ICT) into the sensorized life of the city, from the mobility systems to the ways citizens produce, consume, and share energy, public services, and community engagement. Through this endeavor, smart cities will pave the way for efficient, effective, and leveraging solutions using digital tools; smarter use of resources; services that will improve the way of life; and more inclusive and responsive urban ecosystems.[150]

Smart city as an architecture of the urban environment is designed to use technology in fostering urban sustainability, efficiency, and livability. By deploying Internet of Things (IoT) devices, sensors, and connected infrastructure, smart cities continuously gather large volumes of real-time data on different urban aspects (traffic, energy, air quality, public safety, etc.). Recently I have been trying to do some advanced analytics with the help of some Machine Learning algorithms over this data so as to get some insights out of this data which will help us to make a decision. Smart traffic management systems, for example, can adjust traffic lights on the fly based on real-time traffic conditions, improving traffic flow, reducing gridlock, and even lowering fuel consumption and emissions. On a related note, smart energy grids can promote the development and delivery of clean energy sources - such as solar or wind - for carbon-neutral residential and business customers, ultimately helping to reduce harmful emissions and enhance environmental sustainability within the city. Not only is technology increasingly critical to making urban services more efficient and livable for the people who use them, Smart cities solutions simplify the administrative processes, help to establish seamless communication between citizens and local government, and enable the delivery of personalized and proactive services.[151] Of course, mobile applications can enable citizens to crowdsource problem reports, information, and feedback on city services, and contribute to more participatory and more collaborative local e-governance. Smart city technologies also enable the management of public utilities, such as water, and waste management systems to be streamlined, thereby having a positive effect on resource management and lowering operational costs.

[150] Douay, N. (2018). Urban Planning in the Digital Age. United Kingdom: Wiley.
[151] Thornbush, M. J., Golubchikov, O. (2019). Sustainable Urbanism in Digital Transitions: From Low Carbon to Smart Sustainable Cities. Germany: Springer International Publishing.

The potential payoffs of smart city work are abundantly clear and relatively accessible. Smart cities improve the efficiency of urban processes and services through the use of technology, enhancing the quality of our lives and cities. They can relieve traffic congestion, improve public safety, save energy, and help build stronger, healthier, more inclusive communities. Smart city projects can stimulate the economy, attract investments, reward innovation, and create new jobs in technology, data science, and urban planning, among others. Moreover, smart cities can help the wider international community to achieve global sustainability targets (for example, reducing carbon emissions, increasing the use of renewable energies, and creating more durable infrastructures).[152]

But creating smart cities is not without its trials, the barriers that they face need to be dealt with carefully in order to make them functional and sustainable in the long run. While the volume of data generated grows, one of the overriding challenges of the digital evolution is the large investment needed in the digital infrastructure, such as the deployment of sensors, communication networks, and data processing capabilities. It entails considerable funding and clarity of the long-standing advantages of smart city measures. The system integration of digital technologies within urban spaces brings significant issues surrounding data privacy, security, and governance. This is important not only to maintain the trust of the public in government but also to protect the rights of individuals by responsibly collecting, storing, and using citizen data. One of the biggest problems here is that cities are known to increase social and economic disparities as, even with its benefits and increasingly cheaper smart technology offer to cities, wealthier cities are likely to enjoy a higher level of service, citizens are given access to better technologies and infrastructure, intelligent and data management services (such as predictive analysis of public services, for example). The digital divide means that smart cities can work against marginalized communities if they do not have access to the technology and digital resources to participate. Smart cities' services and opportunities must be evenly provided in order to make sure social differences remain as low as possible in their field and to enable urban development in a data-driven way to be inclusive. Finally, the speed of technological change means that city governments need to adopt more iterative, agile, and adaptive approaches to smart city planning, policymaking, and governance. Smart cities stand for a new paradigm of city development, which is efficient, sustainable, and enhancing the quality of life by using technology to form better urban places. The goal of a smart city is to use information and communication technology (ICT) to harness the potential of digital tools and solutions to optimize resource utilization, provide better services, and deliver a more responsive and adaptive urban ecosystem. But, as indicated, the implementation of smart city initiatives is not without its own set of challenges which necessitates

[152] Smart Cities and Smart Governance: Towards the 22nd Century Sustainable City. (2021). Germany: Springer International Publishing.

investment, protects the right to data privacy and security, and ensures inclusive and equitable development. Fast forward to the present, where new cities are falling over themselves to become smart cities and it is now more critical than ever for cities of all sizes and geographies to evolve all-encompassing smart city strategies that can complement technological innovation with social, economic, and environmental sustainability in order to ensure that all citizens reap the rewards of smart cities.[153]

LEGAL CHALLENGES IN DIGITAL URBAN PLANNING

The pace of change in digitization and integration of digital technologies into urban planning processes is leading to an emerging, but distinct, suite of legal challenges that must be overcome in order to deliver smart cities that are environmentally, socially, and economically sustainable and which contribute to the global development agenda. There are two areas in particular that will require significant focus: updating zoning laws and implementing tough but responsible data governance and privacy regulations.

I will argue that the usage of zoning laws is a cornerstone in framing the physical and functional traits of urban spaces, regulating land use, construction density, and growth patterns. Smart city projects are trying to raise standards for the built environment but the form of benefits that smart city would provide are potentially challenging for traditional zoning frames to cater for the demand for space and data. Given the proliferation of digital technologies in urban infrastructure, including sensors, communication networks, and data processing facilities, a fresh perspective on planning should also entail a re-examination of related zoning rules. This can mean space assignment and need centered modifications to codes around the establishment of IoT devices and smart city infrastructure.[154] Emerging urban uses such as smart mobility hubs, digital innovation districts and data centers may not fit well within traditional zoning classifications, leading to new land use classes and development standards. Second, digital technologies are dynamic, meaning that these zoning regulations are likely to shift very quickly and can only remain stable and enduring. While smart city technologies march on, zoning laws need to keep pace, ready to change and evolve as needs and requirements increase. We need zoning that is adaptable and nimble for the times, so as to facilitate the incorporation and the accommodation of changing active transportation options in our communities. To seize the potential of digital technologies in urban development, policymakers and urban planners must navigate the tension between ensuring framework stability and enabling flexibility. A key legal hurdle for digital urban planning is data governance and privacy - particularly without the strong legal framework needed to regulate it. This data almost exclusively comes through the collection, analysis, and

[153] Willis, K. S., Aurigi, A. (2017). Digital and Smart Cities. United Kingdom: Taylor & Francis.
[154] Smart Cities and the UN SDGs. (2021). Netherlands: Elsevier Science.

application of the extensive information streams into the smart city initiatives provided by those sources - IoT devices, sensors, and citizen monitoring of digital platforms. Although this data unlocks significant potential for optimizing the operation of urban services, decision-making, and the quality of life for the citizens, this vision is followed by a series of concerns in data privacy, security, and ethical use of these datasets. Any smart city initiative to collect and process personal data needs to be based on well-defined and rigorous data protection frameworks. These general frameworks for the ethical treatment of citizen data should set out principles and guidelines for responsible data handling that incorporate transparency, accountability, and user agency with respect to personal information. It also requires clinical research organizations (CROs) and sites to meet strict requirements around the collection, storage, and sharing of data, as well as effective cybersecurity measures to protect against unauthorized access, breaches, and misuse. Finally, data governance frameworks should integrate matters of data ownership, access rights, and data usage in the public interest with the need to respect individuals' privacy.[155]

One of the struggles in trying to grow smart cities is the ability to share data and be interoperable, making it seamless for data to be exchanged between disparate systems and stakeholders. It includes creating common data warehouses, protocols, and APIs to easily interconnect data from different sources to analyze it. Yet the enforcement of these standards should be accompanied by appropriate legal instruments and provisions that will ensure data security, protect intellectual property, and that the provided data is not misused or employed for other ulterior motives. There are bigger legal challenges to overcome in the smart cities - especially regarding data governance and privacy, and it is beyond the technical aspect of managing the data. So that means that the ethical question of data-driven decision-making and the concern for the rights of the individual and the socio-economic well-being of society become central, as it has already been mentioned. The algorithms and artificial intelligence deployed in urban planning and service provision must be highly regulated, oversighted and responsible to prevent potentially discriminatory effects that would only increase social inequality. Regulations have to secure that the advantages of dataisms in the cities get shared equally amongst the residents, guaranteeing citizen's rights and fair treatment, especially when basic needs are at risk.[156] The development of smart cities and the incorporation of digital technologies in the urban planning processes, raise two significant legal challenges: the safeguard of intellectual property rights (IPR) and the environmental compliance and sustainable standards. The development of new technologies and solutions in smart cities is in large part driven by innovation, and the protection of these innovations is a critical element in facilitating the development of smart cities. Smart city infrastructure, such as IoT

[155] Designing, Developing, and Facilitating Smart Cities: Urban Design to IoT Solutions. (2016). Germany: Springer International Publishing.
[156] E-Democracy for Smart Cities. (2017). Singapore: Springer Nature Singapore.

devices, software applications, and data analytics platforms, are costly to design, research, and develop. Protection of their inventions, designs, proprietary technologies from copying or any other form of unauthorized use or replication is vital for companies and innovators and this is ensured by IPR protection. But because smart city ecosystems are intricate and internetted ecosystems, the system facing IPR management can be so hard.

Smart city applications also require collaboration between technology providers, city authorities and third-party developers (combined with a few other stakeholders). The collaborative nature has prompted discussions on who owns, licenses and shares intellectual property. Legal frameworks should be clear and provide information and certainty about the rights and obligations of relevant stakeholders; ensuring that IPR are respected while also facilitating innovation and dissemination of information. This might involve the design of innovation-supporting licensing models that strike a balance between IPR owners' interests and the requirement of interoperability and the opening of critical technologies and datasets.[157] Furthermore, the very fast-evolving technology in smart cities means that any IPR protection strategy needs to be agile and adaptable. Patents, copyrights, and the related traditional laws may not work for the changing digital environment. We need new legal tools (e.g., patent pools, open-source licensing, fair use provisions) that policymakers can deploy to foster the sharing and development of technologies, while continuing to protect the interests of inventors and creators. The aim is to generate an IPR framework that drives innovation, supports cooperation and facilitates explicit use of smart city solutions. The cornerstone of legal answerability in the sphere of the digitally-borne urban planning is the necessitated arrangement of environmental nationalism by way of sustainability criterion. Smart cities can play a critical role in helping meet sustainability targets by reducing the demand for resources, cutting CO2 emissions and supporting the spread of clean technologies. Nonetheless, the roll-out of digital infrastructures through a smart city framework must also be done in an environmentally regulatory fashion and to accommodate the needs of a sustainable future. Digital technologies and urban environments: A tale of two potential environmental impacts For example, smart city solutions enable more efficient use of resources, such as energy and water, via real-time monitoring, optimization algorithms, or demand-response mechanisms. They can also help transition low-carbon transportation systems like electric vehicles and smart mobility services. Meanwhile, the creation, implementation, preservation, and abandonment of electronic devices and infrastructure can be a major source of e-waste, power use, and CO2 emissions.[158] Legal frameworks must set standards and guidelines for the design, deployment and operation of digital technologies to ensure the environmental

[157] Sustainable Smart City Transitions: Theoretical Foundations, Sociotechnical Assemblage and Governance Mechanisms. (2022). United Kingdom: Taylor & Francis.
[158] Bibri, S. E. (2020). Advances in the Leading Paradigms of Urbanism and Their Amalgamation: Compact Cities, Eco–Cities, and Data–Driven Smart Cities. Germany: Springer International Publishing.

sustainability of smart city initiatives. For example, establishing energy efficiency standards for IoT devices and data centers, supporting renewable energy sourcing and recycling practices for e-waste. Smart evaluation to minimized smart city projects on natural resources, biodiversity and ecosystems through environmental impact assessment. Likewise, a set of legal tools ought to be drafted for the same purpose, in force in the most comprehensive manner by the smart city actors in terms of environmental accountability, efficiency and economy. This may involve requirements for reporting and disclosure, third-party audits, and sanctions for non-compliance. But after that, we need to offer people to make green behaviours as well as novel sustainable solutions interesting enough to catch on.

Rights-centric issues with clear legal boundaries in the area of IPR protection and environmental compliance in smart cities calling for a forward and team-centric approach. It is therefore essential that lawmakers and industry, together with environmental experts and all other stakeholders, develop a fair legal framework that supports innovation, sustainability and the common good. There are also requests on cities to put in place frameworks and benchmarks to enable the ethical implementation of digital technologies and realise the visions of smart cities in an environmentally sustainable manner.[159]

PUBLIC POLICY IMPLEMENTATION

This has broad public policy ramifications and can make the integration of digital of digital technologies into urban planning problematic. As the technology pervades the city for an extension of urban solution, boosting techies' life and economy in cities, there should be rules and standards for the new set, keeping the delicate singularity of technology and urban development, and finding the way to harmonize innovation and public interest.

For smart cities, one of the most significant challenges in the realm of public policy concerns the establishment of guidelines and standards. The use of digital technologies within cities implicates various stakeholders (including, to name just a few, city authorities, technology providers, service operators and the citizens themselves). A framework should be such as to ensure a disciplined execution of steps, outlining clear roles, responsibilities and expectations per stakeholder in the smart city initiatives execution cycle. These standards include everything from the technical specifications for how data would be shared and secure through to governance processes decision making through to oversight and accountability. These guidelines and rules provide necessary in particular in the case of the security and the privacy of information records. Smart city technology operates by collecting masses of data on our behavior, preferences, and

[159] Law and the New Urban Agenda. (2020). United Kingdom: Taylor & Francis.

whereabouts, and this makes it ripe for exploitation and unauthorized intrusion. Public policies must ensure that proper data protection levels are maintained, using strict measures in data collection, storage, and sharing. People should own their own data and know what it is being used for.[160] Moreover, it is necessary to enforce security standards to protect the smart city infrastructure from potential cyber threats and vulnerabilities. A further public policy consideration is how to regulate the intertwining of technology with urbanism. Smart city efforts may take the form of land use patterns, infrastructure planning, transportation systems, or the connecting and restoring of social networks. Urban policymakers need to weigh the sociotechnical consequences of the technology-led development of cities and it is important that such development becomes consistent with state and city objectives and approaches governing city planning and sustainability. The solution to this would have to be one that takes a holistic and integrated approach to urban planning, where technology is not seen as the key solution but more as part of the toolkit to aid and accentuate urban development strategies.[161]

To ensure that this occurs, public policies need to encourage a seamless integration of smart city technologies in urban infrastructure - from transport and energy to public space. Guided by principles of inclusivity, accessibility, and resilience, if this integration is to be implemented, the fruits of the smart city initiatives should be widely distributed in different neighbourhoods and communities. In addition to controlling these impacts, the catalytic influence of technology and urban development relies on constant observation, assessment and adjustment. In order to keep pace as smart city technologies advance and confront new challenges and use cases, public policies will have to be adaptive and reactive to shifting demands/non-negotiables. We need feedback loops and participatory mechanisms that are able to allow citizens, stakeholders, and experts to offer their thoughts and contribute to the shaping of smart city initiatives. This is a complex public policy challenge which is, at its core, about balancing innovation with the public interest in the context of smart cities. Advances in technology are moving so quickly that it opens up enormous choices for the city innovation to develop novel services and applications, business models and create many different kinds of partnerships. At the same time, innovation cannot be permitted at the cost of public interest. Cities and their constituencies need to ensure that the benefits of smart city innovations get shared widely and also that the risks and unintended consequences are well-managed with the help of public policies. This means practical application to issues of digital inclusion and eliminating the digital divide, ensuring that all citizens have access to the skills, resources and opportunities that smart

[160] Human Smart Cities: Rethinking the Interplay Between Design and Planning. (n.d.). Germany: Springer International Publishing.
[161] Creating Smart Cities. (2018). United Kingdom: Taylor & Francis.

city technologies can bring. It also means building in protections against any negative consequences that might come with innovation - like a loss of jobs, less privacy, or widened societal gaps.[162]

There needs to be proactive and open dialogue between different stakeholders including the technology sector, academia, civil society and citizen groups for maintaining an equilibrium between innovation and the greater public interest. Collaborative approaches, such as public-private partnerships and innovation sandboxes can help support the responsible development of innovation while safeguarding public values and interests. Policies and regulation must also support the creation of long-lasting ethical and sustainable innovation frameworks that should be designed specifically to serve as the pillars of smart cities development. This will also involve setting standards for the ethical and responsible use of new technologies-- like artificial intelligence and big data analytics-- in city-making practices. By that I mean taking that further to looking at human-centred design principles and going beyond impact assessments that define the socio-economic and environmental potential of a smart city innovation. The public policy implications of smart cities are complex and varied and require an integrated whole and contingent responses. Governance should define frameworks and rules of operation, controlling both the technological layer and the actual city construction, and should balance innovation with the general interest. Cities have a crucial role to play by leading this transformation with human-centered, open and inclusive public policies that take advantage of the opportunities that automation bring and create the necessary conditions for safely harvesting the fruits of smart cities in a fair and sustainable manner.[163]

PPP IN SMART CITY DEVELOPMENT & COMPARATIVE ANALYSIS OF LEGAL FRAMEWORK

Public-private partnerships (PPPs) have become an essential tool for promoting smart cities. As a model of collaboration between the public and private sectors, PPPs combine the knowledge, resources, and innovation of public authorities with the experience, creativity, and profitability of private enterprises. In the context of smart city development, PPPs assume collaboration between city authorities, technology companies, service providers, and other relevant stakeholders to conceptualize, develop, and implement smart city projects.[164]

[162] Transforming City Governments for Successful Smart Cities. (2015). Germany: Springer International Publishing.
[163] Holistic Approach for Decision Making Towards Designing Smart Cities. (2022). Switzerland: Springer International Publishing.
[164] Slone, D. K., Goldstein, D. S., Gowder, W. A. (2008). A Legal Guide to Urban and Sustainable Development for Planners, Developers and Architects. United Kingdom: Wiley.

There are many benefits associated with PPPs that include the ability to pool financial resources, mutual risk, and profit sharing, and access to human capital. In the context of the development of smart cities, PPPs can take many forms: from short-term projects like the construction of the IoT infrastructure, smart city services, or data platforms to long-term strategic collaborations that may span the full life-cycle of a smart city project. Technology companies and service providers have much to give to smart cities. As potential sources of expertise and state-of-the-art equipment solutions, private companies can help cities integrate the most recent technological innovations. PPPs are meant to boost innovation further, which may lead private companies to develop better, cheaper, and more efficient production and delivery technologies.

Nonetheless, one needs to ensure the underlying legislation and regulation framework is put in place to balance the rights, obligations, and expectations of the partners in PPP contracts. These include:

- Transparency, due diligence, and equity of the arrangement.
- The risks to be shared – owing to the significant initial investments required and long-term commitments needed, risks must be vested-conditions must be favorable for both the public and private entities.
- Possible rewards to share.
- Intellectual Property Rights (IPR) and capital ownership.
- Dispute resolution.
- Confidentiality, ownership rights, and conditions for termination.
- Robust legal frameworks are essential to ensure the transparency, accountability, and fairness of PPPs, protecting the interests of both the public and private partners.

Risk/reward allocation is a fundamental legal aspect when structuring PPPs for smart cities. Most smart city projects are capital-intensive and require partners to make long-term investments in shared risks between public and private entities. The responsibilities and liabilities of each party have to be clearly spelled out in the legal agreements with facilities for sharing revenues and performance bon- uses.[165] On PPPs for smart city development, one of the significant legal aspects is the protection of intellectual property rights (IPR). Light on IPR: Smart city technologies and solutions are often based on proprietary software/algorithms/data analytics tools, and it is crucial to ensure that the IPR of private partners are not infringed. Also, any legal framework should ensure that key infrastructure and data will remain under

[165] Bibri, S. E. (2019). Big Data Science and Analytics for Smart Sustainable Urbanism: Unprecedented Paradigmatic Shifts and Practical Advancements. Germany: Springer International Publishing.

control of the public sector, and that the benefits of smart city innovations are widely spread among the population of cities.[166]

In addition to the above, data governance and privacy are very important legal considerations in PPPs for developing a smart city. Smart City projects collect a multitude of data on citizen behavior, preference, and movement, and it is imperative that this data is collected, stored, and used responsibly and ethically. Legal structures should lay down basic principles determining who would be the rights owner of data, how data can be collected, stored and shared, along with facts about data protection and privacy The legal issues and risks in creating smart city PPPs are extensive and situation-specific, and rarely is there one-size-fits-all solution that can be used. This analysis of legal frameworks in a range of jurisdictions provides a comparison of different models and best practices. Some countries, such as India and Brazil, have their own smart city policies and programs linked with PPPs, which could give some predictability to private operators. These policies will often have particular provisions in regard to procurement, risk allocation, performance standards as well as incentives and support mechanisms for private sector participation. In other jurisdictions, such as the European Union, the legal framework for PPPs in smart city development would instead be influenced by more general public procurement and concession laws, and data protection and privacy regulations. The EU too has developed numerous programs and funding mechanisms to encourage smart cities, such as the European Innovation Partnership on Smart Cities and Communities.[167]

Smart cities and PPP: Fragmented legal landscape in the USICLEI -- First, in the United States, the legal landscape is more fragmented for PPPs in smart city development, with different states and municipalities taking their own approaches and creating regulations. But there are attempts to create some level of consistency and guidance, 1example being the Smart Cities Council's Smart Cities Readiness Guide which lays out a blueprint for creating a smart city. While the legal framework in 20 countries differ significantly on some points, including whether justification is an affirmative defense or a general limitation on liability, overall, several themes and best practices are evident. These principles relate to the value of clear and open procurement procedures, the need for agreements that can flex and bend, the significance of such engagement and the necessity to continuously monitor and evaluate how well PPPs are performing. The role of PPPs in contributing to the success of smart cities by drawing on the skills, economies of scale / expertise and innovation of the public and the private sectors is vital. But to thrive, the future of these partnerships requires the implementation of explicit, strong legal frameworks separating what rights, duties,

[166] Smarter as the New Urban Agenda: A Comprehensive View of the 21st Century City. (2015). Germany: Springer International Publishing.
[167] Urban Commons, Future Smart Cities and Sustainability. (2023). Germany: Springer International Publishing.

and expectations exist for each involving party. A comparative analysis of legal frameworks from different countries would show a wide spectrum of approaches, together with best practices and demonstrate the need for tailored and context-specific measures. As cities grow to welcome the smart city era, it is essential to establish and evolve legal frameworks to encourage innovation and protect citizens and the broader societal interest, whilst also maintaining the longer-term sustainability and resilience of smart city development.

CONCLUSION

The role of legal instruments in structuring the emergence of the sustainable smart cities of the digital age has been examined in this paper. The need for a comprehensive legal framework goes without saying, especially as cities respond to the intractable challenges of urban living with equally technology-heavy solutions. The study itself has shown that guidelines and standards need to be improved and that technology and urbanism must be better managed, but also that a reasonably free rein must be given to private initiative. In addition, the study pointed to the importance of protecting intellectual property rights, social and environmental compliance, as well as sustainability standards when it comes to the ethical implementation of smart city technologies.[168]

Additionally, by examining public-private partnerships, we have gained important insights into the team-based efforts that will be needed to advance the smart cities agenda and how the legal frameworks differ across different jurisdictions—a diversity of approaches is readily apparent, as are context-specific solutions. As cities morph and reconfigure for the digital realm, we need to collectively be developing a more nuanced library of legal tools that are nearly as nimble as the technology they are regulating. Cities need to cement a solid legal underpinning to foster an innovation-friendly environment, safeguard citizen rights, and make sure benefits from smart city development are shared timely and equitably, as well as continued over time. This study ultimately underscores the critical role of law in determining the future of urban spaces, and calls for a precautionary and responsive approach to law that can maximize the benefits of digital technologies whilst minimizing the downside risks.

[168] Smart City 2.0: Strategies And Innovations For City Development. (2023). Singapore: World Scientific Publishing Company.

ARTICLE NO – 8

VI INTERNATIONAL CONFERENCE ON LAW, MANAGEMENT AND SOCIAL SCIENCE

Theme

Cyber Sustainable India: Data Privacy, Security and IPR in the Digital Age

Sub Theme

Intellectual Property Rights in the Era of Artificial Intelligence

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INTELLECTUAL PROPERTY RIGHTS
IN THE ERA OF ARTIFICIAL INTELLIGENCE

ABSTRACT

The confluence of artificial intelligence (AI) and legal frameworks demands that laws be updated to reflect new developments in technology. Artificial Intelligence has the potential to profoundly impact many human endeavours, including a large segment of the legal industry, as it continues to advance at a rapid pace. Attorneys and their teams spend a great deal of time understanding and submitting patent claims. The process entails extensive research and evaluations of the uniqueness, practicality, and non-obviousness of goods and procedures for which patent applications are made, which ended in high expenses.

Artificial Intelligence (AI) may dramatically cut down on the time and cost associated with patenting. This study investigates how conventional ideas of intellectual property (IP) are being widened to account for artificial intelligence's disruptive effects. Contrariwise, providing IP protection. Integrating AI into IP processes has the potential to significantly reduce temporal and financial expenditures, thereby enhancing procedural efficiency and economic outcomes. However, this integration also poses risks to innovation and growth, as it may undermine the foundational principles of IPR by creating mechanisms that potentially stifle human creativity.

Current IP policies must evolve to address these emerging issues, specifically concerning the recognition of AI as an inventor and the appropriate attribution of rights and responsibilities. Policymakers are thereby tasked with developing new standards and guidelines to ensure that the IP regime remains relevant and effective in fostering innovation in the AI era.

In summary, while AI has the transformative potential to revolutionize the field of intellectual property, it also necessitates a thoughtful re-examination of existing laws and policies to ensure that both human and AI-driven innovations are equitably and effectively protected and incentivized.

Key words: Artificial Intelligence; Intellectual Property Right; Human Right; Transformation

I. INTRODUCTION

Sometime early in this century the intelligence of machines will exceed that of humans. Within a quarter of a century, machines will exhibit the full range of human intellect, emotions and skills, ranging from musical and other creative aptitudes to physical movement. They will claim to have feelings and, unlike today's virtual personalities, will be convincing when they tell us so. – Ray Kurzweil (2008)[169]

Many of us have probably seen or heard of the Benedict Cumberbatch film "The Imitation Game" or the Arnold Schwarzenegger film "The Terminator." These films centre on extraordinarily intelligent devices that resemble humans; But it's shifting away from fiction and regarding science in recent years. Technology continues to change quickly, and artificial intelligence (AI) systems are getting more and more widely used.

The Imitation Game, in particular, shows a Alan Turing was an exceedingly unique English mathematician who may have been the first to work on intelligent machines. AI is one of the most noteworthy technological advancements of the past century.[170] Once considered a remote possibility reserved for science fiction, AI has advanced enough to approach a technological tipping point of generating ground breaking effects on humanity and is "likely to leave no stratum of society untouched"[171]

But as time goes on, it starts to resemble science more than fiction. Artificial intelligence (AI) systems are getting more and more popular as the world of technology changes quickly. As more advanced technologies get incorporated into the same, it won't be long until these systems begin to create amazing inventions on their own, completely independent of human feedback. Artificial Intelligence is the ability of a machine to mimic intelligent behaviour.

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[169]Kurzweil, R. (2009, March 23). The coming merging of mind and machine. Scientific American. https://www.scientificamerican.com/article/merging-of-mind-and-machine.

[170] Artificial Intelligence & Intellectual Property Rights. (2016, October). Clairvolex. https://clairvolex.com/PDFs/October-2016-Mailer-1.pdf

[171] Goode, L. (2018, January 19). Google CEO Sundar Pichai compares impact of AI to electricity and fire. The Verge. https://www.theverge.com/2018/1/19/16911354/google-ceo-sundar-pichai-ai-artificial-intelligence-fire-electricity-jobs-cancer

As artificial intelligence (AI) systems become increasingly adept of producing innovative works and inventions on their own, significant issues regarding the allocation of intellectual property rights (IPR) to AI-generated outputs arise. The IPR laws in place today, including those in India, were not intended to deal with machines independently generating information that is protected. India's legal system and jurisprudence will face major obstacles as AI's capabilities advance. This article looks at the problems AI presents for copyright and patent law in India and considers potential fixes to strike a balance among advocating AI innovation and safeguarding the rights of human creators.

II. WHAT IS ARTIFICIAL INTELLIGENCE?

Computers, coupled with human intelligence, have advanced to even make decisions on their own. This ability of a computer system to take decisions by itself came to be known as artificial intelligence, in common parlance.[172] AI is not a new phenomenon, with much of its theoretical and technological underpinning developed over the past 70 years by computer scientists such as Alan Turing, Marvin Minsky and John McCarthy. AI has already existed to some degree in many industries and governments.[173] The term 'artificial intelligence' was formally coined by Mr. John McCarthy, a computer scientist at a conference in 1956. According to him, it was the notion of a program, processing and acting on information, such that the result is parallel to how an intelligent person would respond in response to similar input.[174] No single definition of AI is accepted by all practitioners. Some define it broadly as a computerized system exhibiting behaviour commonly thought of as requiring intelligence, whereas others define AI as a system capable of rationally solving complex problems or taking appropriate action to achieve its goals in real-world circumstances.[175] AI is often described based on its problem space, such as logical reasoning, knowledge representation, planning and navigation, natural language processing (NLP) and

[172] Tripathi, S. (2017). Artificial intelligence and intellectual property law. Christ University Law Journal, 7(12), 83-97. https://doi.org/10.12728/culj.12.5
[173] Niti Ayog. (n.d.). Task Force Discussion Paper. http://niti.gov.in/content/nationalstrategy-ai-discussionpaper (accessed on 17th March, 2021).
[174] Acosta, R. (2012, February 17). Artificial intelligence and authorship rights. Harvard Journal of Law & Technology. https://jolt.law.harvard.edu/digest/artificial-intelligence-and-authorship-rights (accessed on 17th March, 2021).
[175] Chen, F. (2016, June 10). AI, deep learning, and machine learning: A primer. Andreesen Horowitz. https://a16z.com/2016/06/10/ai-deep-learning-machines (accessed on 17th March, 2021).

perception,[176] or based on its often-overlapping subfields, including machine learning (ML), deep learning, artificial neural networks, expert systems and robotics.[177]

III. IMPACT OF ARTIFICIAL INTELLIGENCE ON THE IPR'S

The demand for IPR protection developed as new technologies and artificial intelligence invented. The digital revolution of the late twentieth century and the emergence of internet asa worldwide communication means, is creating a continuous pressure on IPR's adaptation.[178] In response to the emergence of novel technology and the protection of intellectual property rights, the World Intellectual Property Organisation (WIPO) has adopted a number of treaties. Robots and artificial intelligence (AI) have historically been the focus of science fiction, yet they are now a reality that we have to contend with. The AI market is predicted to grow from $ 8 billion in 2016 to more than $ 47 Billion in 2020 according to market intelligence firm (IDC).[179] AI is set to increase rapidly, being enabled by the convergence of big data, ready availability of processing power, alongside the cost-effective infrastructure being available. If each AI is different in its specific implementation, we also admit that many modern AI relate to intellectual property.[180] issues may also arise out of this development. In fact, AIs have the potential to engage in acts of content creation by replicating aspects of human cognition. In addition, many AI systems undergo a training process, where they develop their own decision-making algorithms and rules by practicing decision making and using feedback to improve future decisions.[181] Additionally, immense quantities of input data are routinely examined by AI systems in order to find statistical features. However, due to one primary reason—that is, the majority of IPs are human creations—AI may encounter limitations in certain IP-related scenarios.

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[176] Mills, M. (2016). Artificial intelligence in law: The state of play. Thomson Reuters. https://www.neotalogic.com/wp-content/uploads/2016/04/Artificial-Intelligence-in-Law-The-State-of-Play-2016.pdf (accessed on 17th March, 2021).

[177] Future of AI. (n.d.). https://www.congress.gov/bill/115th-congress/house-bill/4625/text (accessed on 18th March, 2021).

[178] Abbott, F.M., Cottier, T., & Gurry, F. (1999). The international intellectual property system: Commentary and materials. https://scholar.google.com/citations?user=OXk1rN4AAAAJ&hl=en (accessed on 18th March, 2021).

[179] Soni, N., Sharma, E. K., Singh, N., & Kapoor, A. (2019). Impact of artificial intelligence on businesses: From research, innovation, market deployment to future shifts in business models. https://arxiv.org/ftp/arxiv/papers/1905/1905.02092.pdf (accessed on 18th March, 2021).

[180] Hacker, P. (2018). Teaching fairness to artificial intelligence: Existing and novel strategies against algorithmic discrimination under EU law. Common Market Law Review, 55(4), 1143-1185.

[181] Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. International Journal of Artificial Intelligence in Education, 26(2), 582-599.

IV. WTO REPORT: ENHANCING ARTIFICIAL INTELLIGENCE IN INTELLECTUAL PROPERTY AND NEW CHALLENGES

The World Trade Organisation (WTO) highlighted a recent rise in AI-related applications in the domains of transportation, life and medical sciences, and telecommunications in a report on trends in patent applications and grants released in 2019. Computer vision, speech recognition, and natural language processing are among the technologies that frequently get protected by these patents. In 2017, patent applications filed in the UK, USA, and Europe listed an AI system called DABUS as the inventor. However, all three jurisdictions rejected these applications due to the fact the fact that DABUS is not a legal person, which is a prerequisite in nearly every instance of intellectual property right (IPR) regimes. In a similar vein, the UK Press Association and Urbs Media developed Reporters and Data and Robots (RADAR), an AI system intended to produce local news content based on templates made by journalists alongside human input. The question of whether AI can be acknowledged as an inventor or creator has brought about a lot of discussion in the IPR community as a consequence of an upsurge in patent requests asserting AI authorship or ownership. The difficulty of patenting AI systems under the subject-matter eligibility standard is another problem in the context of AI and IPRs. Unless they are incorporated into working software, algorithms are generally regarded as too nebulous and untechnical to be protected by laws governing intellectual property. IP regulators surrounding the world have created guidelines for assessing and promoting patent protection in these fields in response to the growth of technological advances and the increasing number of applications in these fields. These guidelines make it clear whether algorithms are recognised for patent protection, thus permitting merit-based evaluations of them based on things like novelty and enablement. The ownership and the work being written rights of works of art and inventions produced by AI systems on their own are also important topics of discussion. Even though completely autonomous AI-generated content is still uncommon, this begs the questions of whether or not such creations can be patentably and copyrighted. AI systems are not entitled to the protection provided by current intellectual property laws, which provide rights to corporate or natural persons. Legislating on this topic is still difficult given the nascent stage of AI technology and the ambiguity surrounding definitions of AI and "autonomy." This complexity also extends to figuring out IPR law standards, like how long protection lasts, who receives reimbursement for a licence or and how to tell human from artificial

intelligence (AI) work. Despite these obstacles, the "incentive theory" is one protection of treating computers like authors or inventors and providing them with intellectual property protection. Although computers do not benefit from this recognition, people are encouraged to develop such technologies because they recognise the probable benefits related to safeguarding their rights to intellectual property.

V. AI AND PATENT

The patenting of AI platforms and systems presents certain difficulties. Actually, most AI systems imitate tasks performed by humans. Microsoft's Inner Eye project, for instance, incorporates AI to help oncologists target chemotherapy for cancer promptly**.** By applying machine learning techniques to the analysis of patient magnetic resonance imaging scans, it is able to distinguish tumours from surrounding healthy tissue and bone. The oncologist in question Previously, this task was completed by hand-drawing contours on 3D images. Should a patent application be filed for the work performed by the machine, it would be denied since one of the vital requirements for patentability—that is, the description of the invention's method of operation—is not satisfied in the current case. The fundamental driver of societal transformation is new ideas and inventions.
Historically, patents have served as the central component of an intellectual property law system that has protected inventions. Even though patent law still has strong roots in the era of industrialization, it has, for most of the time, been able to adapt to more recent revolutions, such as the computing revolution, albeit not without difficulties. The world is now at an unprecedented threshold of the most far-reaching revolution whose consequences to patent law in particular are so far reaching that its impact is still unknown. This is the AI revolution.[182]

VI. AI AND COPYRIGHT

Traditional Copyright law does not recognize AI generated works. It only protects the original creations of a human being. In a famous Monkey-Selfie copyright dispute, U.S. Copyright Office clarified that to fall within the protective shield of copyright law a work must be created by a

[182] Chimuka, G. (2019). Impact of artificial intelligence on patent law. Towards a new analytical framework – [the Multi-Level Model]. World Patent Information, 59. https://doi.org/10.1016/j.wpi.2019.101926 (accessed on 17th March, 2021).

human being.[183] The copyrightability of works generated by AI has come under question since this decision. However, in United Kingdom the law is rather different. In UK Copyright Act, there is a provision which stipulates that if a work is computer-generated then the author is taken to be the person who facilitated the work to be created.[184] Analogously, we can presume that the person responsible for establishing the arrangements required for generating the work is the author of artificial intelligence-generated material.

With regard to Indian legal standards, Section 2 (d) of the Copyright Act, 1957, defines "author" "in relation to any literary, dramatic, musical or artistic work which is computer generated, the person who causes the work to be created;"[185] When AI progresses to the point where it is completely autonomous and sophisticated and when it is allowed to make decisions on its own, it can become even more difficult to establish who made the arrangements required to produce the work. Only human authors of creative works are currently eligible for copyright protection. Nonetheless, a few intellectuals have defended the notion of giving non-human authors copyright. They argue that the realm of word "authorship" should be widened to incorporate both human and non-human authors.[186] It's currently highly contentious to assign acknowledge to an AI-generated work.

VII. AI AND TRADE MARK

Conventional trademark law is receiving more attention due to the incorporation of artificial intelligence (AI) into daily life and the evolving nature of the purchasing process. According to Gartner Inc., the majority of start-ups are getting into the AI market. study, it predicted that the global business value derived from AI is projected to reach from $1.2 trillion in 2018 to $3.9 trillion in 2022. And the major factors which sourced AI business value are customer experience,

[183] Singh, S., & Singhania, S. (n.d.). India: Redefine intellectual property with artificial intelligence. Mondaq. https://www.mondaq.com/india/patent/1036180/redefine-intellectual-property-with-artificial-intelligence (accessed on 18th March, 2021).
[184] Hacker, P. (2018). Teaching fairness to artificial intelligence: Existing and novel strategies against algorithmic discrimination under EU law. Common Market Law Review, 55(4), 1143-1185.
[185] Hacker, P. (2018). Teaching fairness to artificial intelligence: Existing and novel strategies against algorithmic discrimination under EU law. Common Market Law Review, 55(4), 1143-1185.
[186] Hacker, P. (2018). Teaching fairness to artificial intelligence: Existing and novel strategies against algorithmic discrimination under EU law. Common Market Law Review, 55(4), 1143-1185.

new revenue and cost reduction.[187] Frontier(less) Retail, a new report on the state of retail industry which included

original consumer data from the UK, US and China markets has released the key findings that 89% of US millennials and 91% of Gen Zers prefer to purchase online.96% of Chinese respondents feared about the counterfeits and 94% about the payment security. 43% of UK millennials and 53% of UK Gen Zers order online and expect to be delivered in no more than two days.[188] And a report by Statista confirmed that 38% of consumers depends upon AI guidance for the purchasing process.[189] Till now the impact of AI on Intellectual Property (IP) has revolved around the

patent law and patent protection of AI technologies. But at present the AI is posing a greater challenge to the trademark law. Trademark law has with stood the three revolutions self-service, E-commerce and social media.

VIII. **CONCLUSION**

Now humankind stands on the threshold of an era when ever more sophisticated robots, androids and other manifestations of artificial intelligence ("AI") seem to be poised to

unleash a new industrial revolution, which is likely to leave no stratum of society untouched, it is vitally important for the legislature to consider its legal and ethical implications and

effects, without stifling innovation.[190] This passage, which is taken from the European Parliament Report on Recommendations on Civil Law Rules on Robotics, provides a succinct overview of two key issues:

1) What an artificial intelligence ("AI") transforms and poses challenges to society; and

2) How regulators attempt to address these issues.

Intellectual property is one area where the impact of AI is readily apparent even though policymakers continue to attempts to anticipate the challenges that lie ahead for various uses of

[187] Gartner Inc. (n.d.). Study on global artificial intelligence business value. Retrieved from https://www.gartner.com/newsroom/id/3872933

[188] JWT Intelligence. (2016, June 15). New trend report: Frontier(less) retail. Retrieved from https://www.jwtintelligence.com

[189]Statista. (n.d.). Artificial intelligence (AI) worldwide. Retrieved from https://www.statista.com/topics/3104/artificial-intelligence-ai-worldwide

[190] European Parliament. (2017, January 27). Report with recommendations on civil law rules on robotics. Retrieved from http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A8-2017-0005+0+DOC+XML+V0//EN (accessed on 17th March, 2021).

the software and weigh the possible results. maintaining up with the rapidly expanding field of artificial intelligence, the current IP laws demand significant modernization. If they are not updated, artificial intelligence is going to keep developing to the point where the laws that are in place will no longer be able fulfil the needs of individuals. Using smart mixed AI and human models like the one mentioned above, could solve the fear problem that human being has and could also serve in making the process of achieving intellectual property rights more smooth, transparent and affective. Most of the laws are not designed substantially to work algorithmic.[191] This is the main justification for the discretions granted to the majority of judges in case decision-making. There seems to be a lack of human experience and legal infrastructure in the approach for completely automating the IP process.

When combined with IP, Artificial Intelligence (AI) has the potential to enhance IP creation processes. As a matter of fact, AI is now truly beneficial to businesses that have complicated and intricate problems to solve. As the volume of data grows, human labour may become more demanding on IP daily tasks. Thus, professionals can devote more time to making strategic decisions thanks to AI technology. Furthermore, by minimising the requirement for manual investigation techniques, it will promote increased accuracy. The true opportunity presented by AI for IP professionals is the ability to access volumes of data that are currently inaccessible and impenetrable.

[191] Future of AI. (n.d.). https://www.congress.gov/bill/115th-congress/house-bill/4625/text (accessed on 18th March, 2021).

ARTICLE NO- 9

"PAVING THE GREEN PATH IN INDIA'S EV REVOLUTION: REGULATION, DIGITIZATION, INTEGRATION, IP, INNOVATION"

SUBMITTED BY:

SUHANI DAS[192], ARKOJIT DEBNATH[193]

UNDER THE SUB THEME: "DIGITALIZATION OF SUSTAINABLE INFRASTRUCTURE: LEGAL FRAMEWORKS FOR GREEN ENERGY, TRANSPORTATION AND URBAN PLANNING"

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[193] Arkojit Debnath, the co-author is a dedicated associate of Mumbai based law firm, Samvida Legal. He has completed his bachelor's degree in B.B.A. LL. B. from KIIT Law School, KIIT DU, Bhubaneshwar in 2024 with specialisation in Intellectual Property Rights. Having industrious knowledge in the regulatory frameworks relating India's EV evolution and digitization, he has shown enough improvement in the field of law.

Contents

ABSTRACT

India's transition to electric vehicles (EVs) presents a complex landscape encompassing regulatory frameworks, digital infrastructure, integration strategies, intellectual property (IP), and innovation challenges. Despite progress, unresolved issues hinder the development of a sustainable EV ecosystem. Ambiguous regulations on manufacturing, sales, and charging infrastructure deter investment and operational efficiency, necessitating clearer policies to spur market growth. The integration of digital technologies like smart grids and IoT-enabled charging stations is crucial for optimizing EV performance and grid stability. However, interoperability, data security, and scalability issues remain obstacles that must be addressed. Effective integration with existing transport and energy infrastructure requires coordinated planning and investment in charging networks, grid upgrades, and urban planning strategies. Strategic management of IP related to EV technologies is vital for innovation and investment attraction. Balancing IP protection with open innovation models is essential but complex. Encouraging research and development in battery technology, vehicle design, and sustainable materials is crucial for enhancing performance and reducing costs, aligning with environmental goals. This research explores these challenges comprehensively, beginning with an analysis of current regulatory gaps and digitalization trends impacting EV adoption. It emphasizes the need for robust digital frameworks and cybersecurity measures to support EV integration into the power grid. The study also examines IP management strategies and the role of collaborative research and development models in fostering innovation across the EV value chain. By synthesizing insights, the study aims to offer actionable recommendations for policymakers, industry stakeholders, and researchers to navigate India's EV revolution successfully. Addressing regulatory clarity, digital innovation, infrastructure integration, IP management, and fostering innovation will be pivotal in realizing India's vision for a sustainable and efficient electric mobility ecosystem.

Keywords: digital infrastructure, innovation, integration strategies, intellectual property (IP)

INTRODUCTION

As per the statistics given by a number of sources, India was the third largest automobile market in the world in terms of sales and fourth largest in terms of production in 2022-2023. According to the data provided by the Ministry of Road Transport and Highways, the sales of electric vehicles leaped over 300% as compared to the sales in 2022. However, the sales of electric vehicles in India accounted for approximately 5% of the total sales of vehicles in the country[194].

Objectives

- The primary objective of this paper is to evaluate existing environmental regulations and to analyze the present regulatory landscape including governmental policies and incentives to promote adoption and use of EVs in India.
- The secondary objective is to explore the role of digitisation in development of EV manufacturing and the impact of data driven marketing decisions for the growth in sales of EVs in India. The integration of IoT (Internet of Things) and digital platforms into the EV ecosystem is also an integral part of this objective.
- Another objective is to evaluate the present infrastructure, analyze the challenges to EV market penetration, and examine how EVs are essential for smart city initiatives and urban mobility in India.
- Other objectives include assessing key patents and innovations, challenges faced by EV start-ups in terms of protection and exploitation of IP rights, and the importance of licensing and collaborations in fostering innovation in the EV sector.

LITERATURE REVIEW

1. **Goswami, R., & Tripathi, G. C. (2020) - Augmentation of charging infrastructure for electric vehicles growth in India (International Journal of Electric and Hybrid Vehicles)** - This research paper gives detailed insights on how India is moving towards a greener future with focus on EV manufacturing and sales. The paper also gives information on various types of incentives given by the government for promoting EVs. The paper is detailed with a lot of statistical data on the subject.

[194] **Deutsche Welle (DW)**. (2023, March 17). India: How electric vehicles are driving a green transition. Retrieved from https://www.dw.com/en/india-how-electric-vehicles-are-driving-a-green-transition/a-65022134

2. **Bhattacharyya, S. S. & Thakre, S. (2021) - Exploring the factors influencing electric vehicle adoption: an empirical investigation in the emerging economy context of India** - This study aims to fill the existing research gaps in the process of adoption of EVs in India by exploring the perceptions of the consumers and industry leaders. It is a comprehensive study of the EV ecosystem in India.
3. **Saha, T., Banerjee, S., & Banerjee, M. (2024) - Introspection of FAME India Scheme in Light of Non-Incentivized Electric Private Four-Wheelers**: Potentials and Possibilities - This article puts forward in details how the FAME Scheme and National Electric Mobility Mission Plan 2020 accelerated adoption and manufacturing of EVs in India.

SCOPE & RESEARCH METHODOLOGY

The scope of this paper focuses on the landscape for EVs in India. The approach is to form a comprehensive review of various aspects of the EV industry including regulations, manufacturing, market dynamics, infrastructure and analyzing such factors to understand current trends and future projections. This article also examines the rules and impacts of various stakeholders of the said industry including private companies, government agencies, businesses and consumers. Additionally, this article also gives a brief idea about the effect of digitization in the EV industry. The main idea is to examine existing policies and regulations, their implementation and suggest and recommend changes for improvement. The article also emphasizes the importance of intellectual property and innovation in growth and development of the said industry. Furthermore, the analysis also includes an examination of present infrastructure and scope of development of charging facilities to support widespread adoption of EVs in India.

REGULATIONS AND EMISSION STANDARDS

OVERVIEW OF NATIONAL AND STATE-LEVEL POLICIES PROMOTING EV ADOPTION

National Policies: India has implemented several initiatives at the national level to promote EV adoption:

1. ***FAME India Scheme (Phase I and II)[195]:***

- **Phase I (2015-2019):** Launched under the Ministry of Heavy Industries and Public Enterprises, aimed to incentivize early adoption of EVs.
- **Phase II (2019-2022):** Extended subsidies and incentives for electric buses, three-wheelers, and two-wheelers, as well as for setting up charging infrastructure.

2. ***National Electric Mobility Mission Plan (NEMMP) 2020[196]:***

- Aims to achieve significant penetration of electric and hybrid vehicles by 2020.
- Includes incentives for R&D, pilot projects, and infrastructure development.

State-Level Policies: Several states in India have also introduced their own policies and incentives to accelerate EV adoption.

- ***Delhi EV Policy (2020)[197]:*** Offers subsidies on the purchase of electric vehicles and setting up of charging infrastructure.
- ***Maharashtra EV Policy (2021)[198]:*** Incentives for manufacturers, consumers, and charging infrastructure developers.

FINANCIAL INCENTIVES FOR MANUFACTURERS AND CONSUMERS

Manufacturers:

- ***Import Duty Reduction:*** Import duty reduction on components for EV manufacturing.

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[195] NITI Aayog. (2021). Handbook of Electric Vehicle Charging Infrastructure Implementation. Retrieved from https://www.niti.gov.in/sites/default/files/202108/HandbookforEVChargingInfrastructureImplementation081221.pdf

[196] **Government of India, Ministry of Heavy Industries & Public Enterprises**. (2012). National Electric Mobility Mission Plan 2020. Retrieved from https://heavyindustries.gov.in/sites/default/files/2023-07/NEMMP-2020.pdf

[197] **Government of NCT of Delhi, Transport Department.** (2020). Delhi Electric Vehicle Policy. Retrieved from https://transport.delhi.gov.in/sites/default/files/Transport/circular-sorders/delhi_electric_vehicles_policy_2020.pdf

[198] **Government of Maharashtra, Environment and Climate Change Department**. (2021). Maharashtra Electric Vehicle Policy. Retrieved from https://www.mahadiscom.in/consumer/wp-content/uploads/2021/09/ED-infra--*EV*--20769-Dt.-02.09.2021-1.pdf

- ***Production Linked Incentive (PLI) Scheme:*** Introduced to encourage local manufacturing of EV components and vehicles.

Consumers:

- ***Subsidies:*** Subsidies on purchase of electric vehicles under the FAME India scheme.
- ***GST Reduction:*** Lower GST rates for electric vehicles compared to conventional vehicles.

REGULATORY FRAMEWORKS FOR EV INFRASTRUCTURE DEVELOPMENT

India has been working on establishing regulatory frameworks to facilitate EV infrastructure development:

- ***Charging Infrastructure:*** Guidelines and standards for setting up public and private charging stations.
- ***Grid Integration:*** Policies to ensure grid compatibility and stability with increasing EV charging demand.

IMPACT OF REGULATIONS ON EV ADOPTION AND INDUSTRY GROWTH

Impact on EV Adoption:

- ***Increase in Sales:*** Incentives and subsidies have led to a significant rise in sales of electric two-wheelers and three-wheelers.
- ***Challenges:*** However, challenges such as high initial costs, range anxiety, and lack of charging infrastructure still exist.

Industry Growth:

- ***Investment:*** Growth in investments in EV manufacturing and charging infrastructure.
- ***Employment:*** New job opportunities in manufacturing, R&D, and services related to EVs.

COMPARISON WITH GLOBAL REGULATORY STANDARDS AND IMPLICATIONS FOR INDIAN MARKET PLAYERS

EU Regulations: The European Union (EU) has established stringent emission norms and targets for reducing greenhouse gas emissions from vehicles. These regulations have been a significant driver for electric vehicle (EV) adoption in Europe. Key aspects include:

- ***Emission Standards:*** Strict CO2 emission limits for new vehicles, incentivizing zero-emission vehicles like electric cars.
- ***Supportive Policies:*** Subsidies, tax incentives, and infrastructure development grants to promote EV adoption.
- ***Market Demand:*** Growing consumer preference for environmentally friendly vehicles due to awareness and regulatory pressure.

China: China has emerged as a global leader in both EV production and adoption. The Chinese government has implemented aggressive policies and substantial subsidies to promote electric mobility. Key factors include:

- ***Subsidies:*** Generous subsidies for EV manufacturers and buyers to reduce purchase prices and promote adoption.
- ***Mandates:*** Production quotas for new energy vehicles (NEVs), encouraging automakers to invest heavily in electric vehicle technology.
- ***Infrastructure:*** Massive investments in charging infrastructure to support the growing number of electric vehicles on the road.

IMPLICATIONS FOR INDIAN MARKET PLAYERS

Competitiveness: For Indian manufacturers, aligning with global regulatory standards and trends is crucial for several reasons:

- ***Export Opportunities:*** To access international markets, especially in regions with stringent emission regulations like the EU.
- ***Global Investments:*** Attracting foreign investments and partnerships requires compliance with global standards and demonstrating technological capabilities in EV manufacturing.
- ***Domestic Market Leadership:*** Meeting high standards ensures competitiveness in the domestic market as well, as consumer awareness and environmental concerns rise.

Technology Transfer: Collaboration with international firms for advanced EV technologies becomes imperative:

- ***Access to Technology:*** Partnerships with global companies facilitate access to advanced EV technologies such as battery management systems, electric drivetrains, and vehicle connectivity.
- ***R&D Capabilities:*** Joint ventures and technology transfers enhance local R&D capabilities, driving innovation and product development in the EV sector.
- ***Scale and Efficiency:*** Leveraging global expertise enables Indian firms to scale production efficiently and meet global quality standards.

Statistics (as of 2023): India has over 2 million electric vehicles on the road, marking a significant increase from previous years. This growth is largely attributed to government incentives such as subsidies and tax benefits under programs like FAME[199] India. Sales of electric two-wheelers and three-wheelers have particularly surged, reflecting increased consumer adoption due to lower operational costs and environmental benefits.

Yearly Evolution:

- ***Policy Adjustments:*** India's policies promoting EV adoption have evolved annually, incorporating feedback from stakeholders and advancements in technology.
- ***Market Dynamics:*** Changes in market dynamics, including consumer preferences, technological advancements, and competitive landscapes, influence policy updates.
- ***Infrastructure Development:*** Continuous efforts are underway to expand EV charging infrastructure across the country to support the growing fleet of electric vehicles.

The Bharat Stage (BS) emission standards[200] are regulatory norms instituted by the Indian government to control air pollutants from internal combustion engine vehicles, ensuring cleaner

[199] Saha, T., Banerjee, S., & Banerjee, M. (2024). Introspection of FAME India Scheme in Light of Non-Incentivized Electric Private Four-Wheelers: Potentials and Possibilities. In *Electric Vehicles and the Future of Energy Efficient Transportation* (pp. 1-20). CRC Press. https://doi.org/10.1201/9781032668123-9

[200] Byju's. (n.d.). Bharat Stage VI norms by 2020. *Byju's*. Retrieved June 19, 2024, from https://byjus.com/free-ias-prep/bharat-stage-vi-norms-by-2020/

air quality. These standards are based on European emission norms and were first introduced in India in 2000.

HISTORY OF EMISSION STANDARDS IN INDIA

- *India 2000 (Equivalent to Euro 1):* Introduced nationwide in 2000, setting initial limits on pollutants emitted by vehicles.
- *BS-II (Equivalent to Euro 2):* Implemented in 2001 in metro cities and expanded to more cities by 2005.
- *BS-III (Equivalent to Euro 3):* Rolled out in phases starting from metros in 2005 and extended nationwide by 2010.
- *BS-IV (Equivalent to Euro 4):* Implemented in major cities from 2010 and extended nationwide by 2017.
- *BS-V and BS-VI:* Originally, BS-V was planned to be implemented nationwide by 2020 and BS-VI by 2024. However, BS-V was skipped to expedite the transition to BS-VI due to environmental concerns and the need for cleaner air.
- *BS-VI (Equivalent to Euro 6):* Introduced in stages, starting with Delhi-NCR in 2018 and extended nationwide by 2020. BS-VI sets the highest vehicle emissions standards in India, significantly reducing particulate matter (PM) and nitrogen oxide (NOx) emissions compared to BS-IV.

DIFFERENCES BETWEEN BS-IV AND BS-VI

- *Particulate Matter (PM):* BS-VI fuels allow for a PM concentration between 20 to 40 micrograms per cubic meter, a significant reduction from up to 120 micrograms per cubic meter in BS-IV.
- *Sulphur Content:* BS-VI fuels have a sulphur content of 10 parts per million (ppm), down from 50 ppm in BS-IV. Lower sulphur content reduces emissions and engine wear.
- *Emission Reductions:* BS-VI vehicles emit 80% less PM and up to 70% less NOx in diesel engines compared to BS-IV. In petrol engines, NOx emissions are reduced by about 25%.
- *Technological Requirements:* BS-VI compliance requires advanced emission control technologies like Diesel Particulate Filters (DPF), Selective Catalytic Reduction (SCR)

systems, and Lean NOx Traps (LNT), along with Real Driving Emission (RDE) testing and On-board Diagnostics (OD).

IMPACT AND CHALLENGES

- Environmental Impact: BS-VI standards are expected to significantly improve air quality by reducing harmful emissions, contributing to public health benefits.
- Cost Implications: Transitioning to BS-VI has increased production costs for automakers, which may translate to higher vehicle prices, especially for diesel and economy segment cars.
- Infrastructure and Implementation: Ensuring availability of BS-VI compliant fuels and supporting infrastructure such as charging stations for electric vehicles remains a challenge.
- Regulatory Compliance: The introduction of BS-VI aligns India with global emission standards, enhancing competitiveness in the international automotive market and attracting investments in cleaner technologies.

IMPACT OF EMISSION STANDARDS ON EV ADOPTION

A. Push Towards Cleaner Vehicles

Stringent Targets: BS VI norms impose strict limits on traditional Internal Combustion Engine (ICE) vehicles, necessitating advanced emission control technologies. This has made ICE vehicles more expensive, narrowing the price gap between conventional vehicles and EVs.

Incentive for EVs: EVs inherently have zero tailpipe emissions, making them compliant with even the strictest emission norms. This advantage positions EVs favourably in markets where emission regulations are tightening.

B. Regulatory Support and Incentives

Government Policies: India's policies like the Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme incentivize EV adoption through subsidies, tax breaks, and funding for

charging infrastructure. These incentives are partly driven by the need to meet emission reduction targets set under international agreements like the Paris Agreement.

Consumer Awareness: Stricter emission norms raise awareness among consumers about environmental impact and health benefits associated with EVs, thereby increasing the attractiveness of electric vehicles.

C. Market Dynamics and Industry Response

Automaker Strategies: To comply with BS VI norms, automakers have invested heavily in upgrading their vehicle technologies. Many are also expanding their EV portfolios to meet both regulatory requirements and consumer demand for cleaner vehicles.

Infrastructure Development: Emission standards indirectly drive the development of EV charging infrastructure. As cities and states aim to reduce vehicular pollution, they incentivize the deployment of charging stations to support EV adoption.

OBJECTIVES OF ENVIRONMENTAL REGULATORY COMPLIANCE

The primary goal of environmental regulatory compliance in India is to protect the environment and natural resources from pollution, degradation, and depletion. This framework strives to achieve several key objectives:

- Ensuring air quality by regulating emissions from industries, vehicles, and other sources to prevent air pollution and its adverse effects on human health and the environment.
- Preserving water resources through the regulation of pollutant discharge into water bodies, promotion of water conservation, and prevention of water pollution to maintain freshwater quality and availability.
- Effective management of waste by establishing guidelines for proper waste handling practices, including segregation, treatment, recycling, and disposal, to minimize environmental impacts.
- Conserving biodiversity by protecting natural habitats and preventing activities that could harm wildlife and their ecosystems.

- Promoting sustainable development by encouraging industries and businesses to adopt environmentally friendly practices and technologies while balancing economic growth with environmental sustainability.

KEY STAKEHOLDERS IN ENVIRONMENTAL REGULATORY COMPLIANCE[201]

- The Ministry of Environment, Forest and Climate Change (MoEFCC), responsible for formulating and implementing national environmental policies, laws, and regulations.
- The Central Pollution Control Board (CPCB), the apex regulatory authority under the MoEFCC, monitors and enforces environmental standards, issues guidelines, and coordinates with state pollution control boards.
- State Pollution Control Boards (SPCBs), established in each state to implement environmental regulations, issue permits, conduct inspections, and ensure compliance.
- Industries and businesses across various sectors are obligated to comply with environmental regulations, obtain necessary permits, and implement pollution control measures.
- Civil Society Organizations (CSOs) and non-governmental organizations (NGOs) play vital roles in raising awareness about environmental issues, advocating for stronger regulations, and monitoring compliance.

IMPORTANCE OF ENVIRONMENTAL REGULATORY COMPLIANCE

- Protecting public health by mitigating pollution and ensuring that air, water, and land resources are safe for human consumption and use.
- Preserving ecosystems and biodiversity through adherence to environmental standards, safeguarding natural habitats and ecological balance.
- Promoting sustainable development by facilitating a harmonious relationship between economic growth and environmental protection, ensuring long-term prosperity.
- Enhancing reputation and gaining a competitive edge in the market for organizations committed to environmental compliance and sustainability.

[201] Diversitech Global. (2023, June 19). Regulatory compliance: Environmental standards in India. *Diversitech Global*. https://www.diversitech-global.com/post/regulatory-compliance-environmental-standards-in-india

- Ensuring legal compliance to avoid penalties, fines, and legal repercussions that could significantly impact an organization's operations and financial stability.

India has established a comprehensive array of environmental laws and regulations aimed at addressing various facets of environmental protection and sustainable development. These laws cover crucial areas such as air pollution control, water pollution control, waste management, and biodiversity conservation. Below is an overview of the major environmental laws and regulations in India, highlighting their objectives, key provisions, and significance in ensuring regulatory compliance.

The Water (Prevention and Control of Pollution) Act: Enacted in 1974, this legislation aims to prevent and control water pollution across India. Key provisions include:

- Mandating the formation of State Pollution Control Boards (SPCBs) in each state to oversee and enforce water pollution control measures.
- Requiring industries, factories, and other establishments to obtain consent from SPCBs before initiating operations or making changes affecting water quality.
- Setting standards for the discharge of effluents and sewage into water bodies to ensure pollutants are treated before being released.

The Air (Prevention and Control of Pollution) Act: Established in 1981, this act targets the prevention and control of air pollution. Key provisions include:

- Establishing the Central Pollution Control Board (CPCB) as the central authority responsible for formulating and implementing policies and standards related to air pollution control.
- Setting National Ambient Air Quality Standards (NAAQS) that specify permissible limits for pollutants such as particulate matter, sulphur dioxide, nitrogen dioxide, and carbon monoxide.
- Prescribing emission standards for industries, power plants, vehicles, and other sources of air pollution to ensure compliance and minimize harmful emissions.

The Environment (Protection) Act: Enacted in 1986, this comprehensive legislation provides a framework for environmental protection and improvement. Key provisions include:

- Mandating Environmental Impact Assessment (EIA) for projects with potential significant environmental impact, requiring proponents to assess and mitigate risks before proceeding.
- Empowering the central government to regulate and prohibit hazardous substances and activities that endanger the environment and human health.
- Providing for the declaration of ecologically sensitive areas, national parks, and wildlife sanctuaries to safeguard biodiversity and natural habitats.

The Hazardous Wastes (Management and Handling) Rules: Introduced in 1989 and subsequently updated, these rules regulate the management, handling, and disposal of hazardous wastes in India. Key provisions include:

- Classifying hazardous wastes based on their characteristics and specifying guidelines for their proper handling, storage, transportation, and disposal.
- Requiring industries generating hazardous wastes to obtain authorization from SPCBs and adhere to prescribed procedures for safe management and disposal.
- Outlining requirements for the treatment, recycling, and disposal of hazardous wastes, emphasizing environmentally sound practices to minimize associated risks.

These major environmental laws and regulations form the backbone of India's efforts to ensure environmental compliance and promote sustainable development. Adherence to these laws is crucial for industries, businesses, and individuals to protect the environment, maintain public health, and contribute to long-term environmental sustainability.

DIGITIZATION

Digitization is one of the biggest catalyst of EV revolution throughout the world and driving rapid advancements in manufacturing, potential customer engagement and management. This section delves into how digital technologies are developing the EV sector across three domains: data-driven decision-making, smart manufacturing and digital platforms and services.

SMART MANUFACTURING[202]

Smart manufacturing refers leveraging state of the art digital technologies to enhance the production of EVs and ensuring quality, scalability and higher efficiency.

Companies have started incorporating automated systems and robotics in the assembly and production lines, which ensures reduction of human errors, increase precision and enhance production capacity and speed. Advanced robotics have been developed in assembling batteries, painting, welding which improves productivity and consistency.

Predictive analytics pertaining to potential issues in the production process with the help of advance equipment and sensors integrated within the production ecosystem. This also helps in predicting maintenance requirements preventing downtime and ensuring operations. In the realm of Digital Twin Technology major automobile companies are now employing replicas of their manufacturing processes. This innovative approach emphasizes real time monitoring and simulation empowering companies to enhance their operations experiment, with production strategies without disrupting the product line and swiftly address any arising issues.

Moreover Additive Manufacturing or 3D printing a type of manufacturing technique is gaining traction across industries such as electric vehicles and automobiles, for crafting intricate components that are not feasible to produce using traditional production methods. This technology provides design flexibility accelerates the production process and significantly minimizes resource wastage.

DATA-DRIVEN DECISION MAKING

Big data and analytics have the power to fundamentally change the industry, empowering smart decisions for impact at a scale not possible earlier. This aspect includes:

- Analysis of large data sets: Using big data analytics to analyse data from multiple sources to gain insights on consumer preferences, market trends and operational efficiencies. These insights are helpful in customized the product & Services as per market need, optimizing the marketing strategy, customer satisfaction.

[202] **OEM Update**. (2023, November 21). EV Manufacturing – Future of Connected Mobility. Retrieved from https://www.oemupdate.com/automation/ev-manufacturing-future-of-connected-mobility-oem-update/

- Predictive Maintenance: Identify when EV components are likely to fail using sensor data and machine learning algorithms. By being proactive, maintenance problems are detected prior to failure - preventing surprise breakdowns, minimizing costly major repairs and stretching each vehicles' lifespan.
- Supply Chain Optimization: Data analytics makes it possible for companies to determine the weakest links in their supply chains so that they can decide whether to replace one supplier with another, and so that they can order in supplies of a particular product just before they start to run short of it. Manufacturers can pick up bottlenecks by breaking down provider knowledge, fix logistics and improve inventory management. This ensures timely and reliable delivery of both basic raw materials and finished goods, preventing any production downtime. These customer insights tell you a great deal, about what behaviors or preferences people have, which you can, then use to describe the user. This data can enable companies to hyper-tailor marketing efforts, amplify customer engagement and develop novel customer-centric features.

DIGITAL PLATFORMS AND SERVICES

Connectivity, efficiency and user experience are necessary factors for development of EV ecosystem and these factors has a great dependence on software and digital solutions.

IoT (Internet of Things) technology makes possible real-time communication between the EV, the user and the infrastructure. Data sharing occurs between the vehicle and charging stations and navigation applications. Data is also utilised for safety and overall efficiency of the vehicle. Connected EVs can receive updates of traffic, routes, etc. through IoT. This also reduces energy consumption and travel time.

Mobile applications have played an important role in ensuring connectivity of the vehicle with the user of the vehicle. Such applications have been constantly developed to offer an array of information at the fingertips of the user of EVs. The information provided by the applications may include overall driving analytics, locations of charging stations, processing payments for paid services, call for roadside assistance in case of breakdown, etc.

Moreover, fleet management technologies[203] by various companies is used worldwide however, it is still being tasted in India to test the readiness of India to implement such technologies for better management of EVs. The said technology helps in tracking vehicles, scheduling maintenance. This technology helps the fleet operators in monitoring the performance and status of each vehicle in real-time, thereby helping improve the overall fleet productivity and efficiency.

In some countries, blockchain technology helps to trade back excess energy back to power grids and can help in identifying counterfeit parts by tracing components of EVs verifying its authenticity and traceability. However, this technology is still yet to be implemented in India. The sole reason for the delay in use of digital technologies in India is because of the lack of infrastructure relating to charging stations and power grid for EVs.

By integrating these technologies, the EV industry in India can witness significant growth and transformation because digitization will not only enhance the reliability and efficiency of manufacturing companies but may also improve the transportation dynamics of the country, user experience and effectiveness in operation.

CHARGING INFRASTRUCTURE & GRID INTEGRATION

To create favorable conditions for the penetration of EVs in India, both from a business and utility perspective, a dialogue between the different stakeholders is essential. Employed largely in the bus and private vehicle segment, penetration of EVs in other market segments, namely two and three-wheelers as well as cars, are negligible. Investments required in charging infrastructure are large, and demand for electricity during charging may pose challenges to distribution utilities, particularly in high charging penetration areas. To facilitate a large-scale roll-out of electric vehicles, there is a need to have a sustainable business model for charging infrastructure owners and regulatory policies to minimize the impact on distribution utilities[204].

The demand charge distortions in the tariff design structures of Indian utilities and innovative business models may be used to make charging infrastructure investments viable. Electric mobility is increasingly perceived as one of the most promising solutions for the twin challenge of transport-

[203] **Driivz**. (n.d.). What is Electric Vehicle (EV) Fleet Management? Retrieved from https://driivz.com/glossary/ev-fleet-management/

[204] Goswami, R., & Tripathi, G. C. (2020). Augmentation of charging infrastructure for electric vehicles growth in India. International Journal of Electric and Hybrid Vehicles, 12(1), 44-58.

related emission reduction and energy security. Government initiatives for achieving electric mobility was first highlighted in the National Electric Mobility Mission Plan which envisaged achieving seven million EV sales by 2020, to save a huge amount of petroleum[205].

The key challenges to large-scale adoption of EVs in India is inadequacy of public charging infrastructure[206]. India needs to develop a strong support of charging infrastructure throughout the country after assessing the density of the population in different places and considering the traffic in that particular area. Infrastructure shall not only be limited to charging stations and battery-swapping stations may be developed for quicker movement across a distance. The development of the EV market has brought in new market players who have engaged themselves in planning and development of such charging infrastructures. Therefore, the overall numbers of stakeholders in the EV Industry has increased rapidly.

Different types of players such as EV manufacturers, charging infra manufacturers, charging point operators governmental bodies, electricity producers and location owners, etc., may set up charging stations. Among these entities the two most important are charging point operators and charging infrastructure manufacturers.

Charging Infrastructure Manufacturers may earn revenue by manufacturing different charging equipment used in manufacturing and selling EVs. Charging infrastructure manufacturers may generate revenue by two possible ways. Firstly, they may address the requirements of setting up a charging station at home or workplace of people and secondly, they can serve the vehicle manufacturers by providing them with hardware for the manufacturing of the vehicles. Another source of revenue for such businesses is by providing scheduled maintenance services to ensure long life of the charging facilities. Maintenance of the public charging infrastructure is also very important in order to ensure uninterrupted power supply to public EV vehicles. Some of the notable companies committed towards developing EV infrastructure in India are Okaya, ABB India, RRT, Delta Electronics, Mass Tech, etc.

Charging Point Operators may generate revenue by setting up and operating networks of chargers. The services include vehicle charging, network solutions and customer support, etc. The pricing

[205] Bhattacharyya, S. S. & Thakre, S. (2021). Exploring the factors influencing electric vehicle adoption: an empirical investigation in the emerging economy context of India.

[206] Canalys. (2024). India aims to propel the EV market in 2024. Retrieved from https://www.canalys.com/insights/india-aims-to-propel-the-ev-market-in-2024

may be Energy based, time base, membership based, etc. Charging of EV is considered a service and not under the purview of the Electricity Act 2003. Some prominent players are Tata Power, Charge Zone, Fortum India, etc.

Every major car manufacturer in India has EV models in their product portfolio and has committed to investing in greening their production. Furthermore, Ola and Uber, the app-based taxi aggregators, have opened up about their fleet electrification targets and have also included public charging infrastructure and suitable charge scheduling as part of their offerings. Public sector units have also committed investment in readying the local power distribution network to handle these growing requirements.

In realization of the need for shared and connected zero emission mobility solutions in India, the Indian government launched the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME-India)[207] scheme in 2015 and its second phase in 2019. The scheme provides incentives ranging from 10-15% of the ex-factory price of electric vehicles (EVs). With the existing fiscal incentives and growing consumer preference towards electric two- and three-wheelers, there has been considerable growth in the EV market in India. Pilot programs in 11 cities have been launched, promoting mode-shift to shared EVs. However, despite these initiatives, the penetration of EVs is relatively low. Future projections are also showing an increasing trend, discrediting beliefs that very high penetration is far away[208].

INTEGRATION OF EVs WITH PUBLIC TRANSPORTATION SYSTEMS

The integration of Electric Vehicles (EVs) into public transportation systems offers significant potential benefits, ranging from environmental sustainability to enhanced urban mobility. Electric Vehicles (EVs) are integral to smart city initiatives aiming to enhance urban sustainability, efficiency, and liveability. Here's an elaboration on how EVs can be integrated effectively:

ADVANTAGES:

[207] NITI Aayog and Rocky Mountain Institute (RMI). India's Electric Mobility Transformation: Progress to date and future opportunities. 2019.

[208] Saha, T., Banerjee, S., & Banerjee, M. (2024). An Introspection on FAME India Scheme in the Light of Non-Incentivized Electric Private Four-Wheelers: Potentials and Possibilities. In Sustainability in Marketing Practice (pp. 115-130). Apple Academic Press.

1. ***Environmental Benefits:*** EVs produce zero tailpipe emissions, reducing air pollution and contributing to improved urban air quality. This is crucial in densely populated urban areas where pollution levels often exceed safe limits.
2. ***Cost Savings:*** Over the long term, EVs can be more cost-effective due to lower fuel and maintenance costs compared to traditional internal combustion engine vehicles. Public transport operators can potentially save on operational expenses by switching to electric fleets.
3. ***Noise Reduction:*** EVs operate quietly compared to conventional buses and taxis, thereby reducing noise pollution in urban environments, which is beneficial for residents' quality of life.
4. ***Enhanced Reliability:*** EVs generally have fewer moving parts and require less maintenance than vehicles with internal combustion engines, leading to improved reliability and uptime for public transport services.

IMPLEMENTATION STRATEGIES:

1. ***Fleet Electrification:*** Public transport agencies can gradually electrify their fleets by replacing diesel or gasoline-powered buses and taxis with electric equivalents. This transition can be supported by government subsidies or incentives to lower the upfront costs of purchasing EVs.
2. ***Charging Infrastructure:*** Establishing a robust charging infrastructure network is crucial for the successful integration of EVs into public transport. This includes installing charging stations at bus depots, taxi stands, and key transit hubs to ensure vehicles remain operational throughout the day.
3. ***Policy Support:*** Governments can play a pivotal role in facilitating the adoption of EVs in public transport through supportive policies. These may include subsidies for vehicle purchases, tax incentives, and regulations mandating a percentage of new public transport vehicles be electric.
4. ***Public Awareness and Education:*** Educating commuters about the benefits of EVs and promoting public confidence in electric public transport are essential steps. This can be achieved through awareness campaigns, pilot projects, and demonstration events showcasing the reliability and efficiency of electric buses and taxis.

KEY CONTRIBUTIONS:

1. ***Reduced Carbon Footprint:*** By promoting the use of EVs, smart cities can significantly reduce greenhouse gas emissions associated with transportation, thereby mitigating climate change impacts.
2. ***Integrated Mobility Solutions:*** EVs complement other smart mobility solutions such as ridesharing, bike-sharing, and autonomous vehicles, creating a seamless and interconnected urban transport ecosystem.
3. ***Enhanced Grid Management:*** Through smart charging solutions, EVs can support grid stability by charging during off-peak hours or using vehicle-to-grid (V2G) technology to provide electricity back to the grid during peak demand periods.
4. ***Data Integration:*** EVs generate substantial data related to vehicle performance, usage patterns, and charging behaviour. Smart cities can leverage this data to optimize transportation planning, infrastructure development, and energy management strategies.

IMPLEMENTATION STRATEGIES:

1. ***Infrastructure Development:*** Smart cities invest in EV charging infrastructure strategically located in residential areas, commercial centers, and public parking facilities to encourage widespread adoption of electric vehicles.
2. ***Policy and Regulation:*** Implementing policies that incentivize EV adoption, such as zero-emission zones, preferential parking for EVs, and reduced tolls or congestion charges, can accelerate the transition to electric mobility within smart city frameworks.
3. ***Public-Private Partnerships:*** Collaborations between government entities, private sector companies, and research institutions can drive innovation in EV technology, infrastructure deployment, and sustainable urban mobility solutions.
4. ***Community Engagement:*** Engaging residents, businesses, and stakeholders in the transition to electric mobility through education, pilot projects, and participatory planning processes ensures that smart city initiatives are inclusive and responsive to local needs.

OVERVIEW OF KEY PATENTS IN THE INDIAN EV SECTOR

India's EV sector has seen significant advancements in technology, resulting in the development of key patents that cover various aspects of electric vehicles. Some notable areas of innovation include:

- ***Battery Technology:*** Patents related to lithium-ion battery improvements, battery management systems (BMS), fast-charging technologies, and thermal management systems.
- ***Electric Drive Systems:*** Patents for electric motor designs, power electronics, regenerative braking systems, and drivetrain innovations.
- ***Vehicle Design:*** Patents covering aerodynamics, lightweight materials, vehicle architecture optimized for electric propulsion, and integrated connectivity features.
- ***Charging Infrastructure:*** Patents related to EV charging stations, smart grid integration, vehicle-to-grid (V2G) technologies, and wireless charging systems.

Companies like Tata Motors, Mahindra Electric, and start-ups such as Ather Energy and Ola Electric have been active in filing patents to protect their innovations and gain a competitive edge in the market.

IMPORTANCE OF IP IN FOSTERING INNOVATION

- ***Incentivizing R&D:*** IP protection provides companies with exclusive rights to their inventions, encouraging them to invest in research and development. This investment leads to the discovery of new technologies and improvements in existing ones, driving innovation forward.
- ***Market Differentiation:*** Patents allow companies to differentiate their products from competitors' offerings. This differentiation can be based on technological advancements, efficiency gains, safety features, or user experience enhancements.
- ***Attracting Investment:*** Strong IP portfolios can attract investment from venture capitalists, strategic partners, and government funding agencies. Investors perceive IP protection as a sign of technological leadership and potential market success, thereby facilitating growth and expansion.

- ***Licensing Opportunities:*** Companies can generate additional revenue streams by licensing their patented technologies to other manufacturers. This can accelerate the adoption of EVs and contribute to the overall growth of the industry.

IP CHALLENGES AND OPPORTUNITIES

COMPETITIVENESS AMONG EV MANUFACTURERS

The EV industry is highly competitive, with manufacturers vying for market share and technological leadership. Key challenges and opportunities include:

- ***Risk of Infringement:*** As the EV market expands, the risk of patent infringement increases. Manufacturers must monitor competitors' activities closely and be prepared to defend their IP rights through litigation or negotiation.
- ***Global Competition:*** Indian EV manufacturers compete not only domestically but also globally. Strong IP protection enables them to enter international markets with confidence, ensuring their innovations are safeguarded against infringement.
- ***Innovation Ecosystem:*** Collaborations with research institutions, universities, and technology partners can enhance R&D capabilities and lead to breakthrough innovations. IP protection is crucial in such collaborations to define ownership and ensure fair distribution of benefits.

STRATEGIES FOR PROTECTING AND LEVERAGING IP

- ***Patent Filings:*** Timely filing of patents for new inventions and improvements in technology. This includes both utility patents for functional aspects and design patents for ornamental features.
- ***IP Portfolio Management:*** Regular review and management of the IP portfolio to assess its relevance, competitive advantage, and potential for licensing or enforcement.

- ***Market Surveillance:*** Monitoring the market for potential infringers and taking proactive measures to enforce IP rights, such as issuing cease-and-desist letters or initiating legal proceedings.
- ***Licensing and Partnerships:*** Exploring licensing agreements with other companies to expand market reach, share technology, and collaborate on joint R&D initiatives. Cross-licensing agreements can also be beneficial to access complementary technologies.
- ***Government Support:*** Leveraging government policies and incentives that promote innovation and provide support for IP protection. This includes subsidies for patent filings, tax incentives for R&D investments, and participation in industry-specific programs.

COLLABORATION AND LICENSING

ROLE OF COLLABORATIONS IN ACCELERATING INNOVATION: Collaborations between EV manufacturers, technology firms, and academic institutions are instrumental in driving innovation in the EV industry. These collaborations leverage expertise, resources, and technologies to accelerate the development and commercialization of new EV technologies.

Example: Mahindra Electric and REE Automotive

Mahindra Electric, a prominent player in India's EV market, collaborated with REE Automotive to develop modular electric platforms. Mahindra Electric contributed its extensive manufacturing expertise and market knowledge, while REE Automotive brought innovative platform designs that enable modular and scalable electric vehicle architectures. This collaboration aims to streamline production, reduce costs, and enhance vehicle performance, ultimately speeding up the introduction of next-generation electric vehicles to the market.

*LICENSING MODELS FOR SHARING TECHNOLOGY AND IP***:** Licensing models are crucial for sharing technology and Intellectual Property (IP) in the EV industry, facilitating the adoption of new innovations and expanding market reach.

Example: Ola Electric's Battery Swapping Technology

Ola Electric, known for its electric scooter manufacturing and infrastructure development efforts, has licensed its battery swapping technology to other companies. This technology allows electric vehicle owners to swap out depleted batteries quickly at dedicated stations instead of waiting for a recharge, thereby addressing range anxiety and enhancing the practicality of electric vehicles. By licensing this technology, Ola Electric promotes the growth of infrastructure and interoperability in India's EV ecosystem, accelerating the adoption of electric mobility solutions.

INNOVATION

RECENT TECHNOLOGICAL INNOVATIONS IN EV DESIGN AND MANUFACTURING: Recent innovations in EV design and manufacturing are pivotal in advancing urban mobility solutions and enhancing vehicle performance.

Example: Ather Energy's Electric Scooters

Ather Energy has introduced a new generation of electric scooters equipped with advanced battery management systems and integrated smart features. These innovations improve battery efficiency, reduce charging times, and extend vehicle range, addressing critical concerns in urban transportation. Ather Energy's focus on performance-oriented electric scooters has set benchmarks in the industry, pushing the boundaries of what electric vehicles can offer in terms of performance and user experience.

ROLE OF R&D IN DRIVING INNOVATION: Research and Development (R&D) investments are fundamental to driving continuous innovation in the EV sector.

Example: Hero Electric

Hero Electric, a leading electric two-wheeler manufacturer in India, has established dedicated R&D centers to develop next-generation electric vehicles tailored to the specific needs of the Indian market. These R&D efforts focus on enhancing vehicle performance, optimizing battery technologies, and improving overall efficiency. By investing in indigenous capabilities and innovation, Hero Electric aims to contribute significantly to the growth of sustainable transportation solutions in India.

START-UPS AND ENTREPRENEURSHIP

CONTRIBUTION OF STARTUPS TO THE EV ECOSYSTEM: Start-ups play a crucial role in disrupting the traditional automotive industry and driving innovation in electric mobility solutions.

Example: Revolt Motors

Revolt Motors entered the Indian market with AI-enabled electric motorcycles that offer unique features such as swappable battery packs and digital connectivity. These innovations cater to the evolving preferences of consumers by providing flexibility in charging options and enhancing user experience through smart technology integration. Revolt Motors' entry into the EV sector has spurred competition and accelerated innovation, contributing to the overall growth and diversification of the EV ecosystem in India.

Successful Indian EV start-ups have demonstrated pioneering efforts in electric vehicle manufacturing and infrastructure development. Examples: Ather Energy and Ola Electric.

CHALLENGES

The transition to electric vehicles (EVs) in India presents a multifaceted challenge encompassing regulatory frameworks, digital infrastructure, integration strategies, intellectual property (IP) concerns, and fostering innovation. Despite significant strides, several critical issues remain unresolved, hindering the full realization of a sustainable and efficient EV ecosystem. Key challenges include:

1. ***Regulatory Frameworks****:* Ambiguities in regulations pertaining to EV manufacturing, sales, and charging infrastructure development pose barriers to market entry and growth. Regulatory clarity is essential to incentivize investment and streamline operations.
2. ***Digitization****:* The integration of digital technologies such as smart grids, IoT-enabled charging stations, and vehicle-to-grid (V2G) systems is crucial for optimizing EV performance and managing grid stability. However, challenges in interoperability, data security, and scalability need addressing.

3. ***Integration with Existing Infrastructure****:* Effective integration of EVs with existing transport and energy infrastructure requires coordinated planning and investment in charging networks, grid upgrades, and urban planning strategies.
4. ***Intellectual Property****:* The protection and management of IP related to EV technologies are critical for fostering innovation and attracting investment. Balancing IP rights with open innovation models is a complex yet necessary endeavour.
5. ***Promoting Innovation****:* Encouraging R&D in battery technology, vehicle design, and sustainable materials is essential for improving performance, reducing costs, and addressing environmental concerns.

RECOMMENDATIONS

To achieve sustainability and foster a sustainable digital India by 2040, it is crucial to implement strategies across key sectors like regulation, digitization, integration, IP, and innovation. Here's how these strategies can be articulated more clearly and aligned with initiatives by the Government of India:

Regulation:

- Engage in shaping robust regulatory frameworks that promote sustainability in both the digital and electric vehicle (EV) sectors, in alignment with initiatives like the National Electric Mobility Mission Plan (NEMMP) and the National Policy on Electronics (NPE).
- Advocate for policies that incentivize the adoption of renewable energy sources to power digital infrastructure and EV charging stations, consistent with the Renewable Energy Act and various state-level policies promoting solar and wind energy.
- Collaborate with governmental bodies and industry stakeholders to ensure compliance with regulations and create an enabling environment for sustainable practices under schemes such as the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme.

Digitization:

- Promote the adoption of digital technologies that enhance sustainability, such as IoT for efficient energy management, smart grids supported by initiatives like the Smart Grid Mission, and AI-driven solutions to optimize resource usage.
- Encourage the development and deployment of digital platforms facilitating the seamless integration of renewable energy sources with the grid and supporting EV infrastructure, as outlined in the Integrated Power Development Scheme (IPDS).
- Invest in digital literacy programs and initiatives to ensure equitable access to digital services nationwide, in line with Digital India initiatives, thereby fostering a digitally inclusive and sustainable society.

Integration:

- Advocate for the integration of renewable energy sources like solar and wind into the national grid, addressing energy requirements for digital infrastructure and electric vehicles, supported by the Green Energy Corridor project.
- Support initiatives enhancing grid stability and resilience through energy storage solutions and demand-side management practices, under programs like the National Mission on Enhanced Energy Efficiency (NMEEE).
- Collaborate with energy providers, technology developers, and policymakers to develop scalable models integrating renewable energy and electric vehicles into urban and rural landscapes, leveraging schemes such as the Atal Mission for Rejuvenation and Urban Transformation (AMRUT).

IP (Intellectual Property):

- Foster an innovation-friendly environment that protects and rewards advancements in sustainable technologies through robust intellectual property frameworks, complemented by initiatives under the National Intellectual Property Rights (IPR) Policy.
- Promote partnerships between academia, research institutions, and private enterprises to accelerate the development of clean energy solutions and digital innovations, aligning with the Start-up India initiative and Atal Innovation Mission.

- Advocate for policies balancing IP protection with knowledge sharing and technology transfer, critical to sustainability and digital inclusion, in accordance with the Science, Technology, and Innovation Policy.

Innovation:

- Cultivate a culture of innovation prioritizing sustainability in digital solutions and EV technologies, supported by initiatives like the Innovation for Clean Air (IFCA) program and the Technology Development Fund (TDF).
- Support start-ups and entrepreneurs developing innovative solutions for renewable energy integration, energy-efficient digital technologies, and affordable electric vehicles, facilitated by schemes such as the National Innovation Mission (NIM).
- Encourage collaboration among industry leaders, start-ups, and research communities to address challenges and seize opportunities in transitioning towards a sustainable digital India, leveraging platforms such as the Make in India initiative and Technology Business Incubators (TBIs).

By focusing on these strategies and leveraging governmental initiatives and schemes, stakeholders can effectively contribute to paving a green path towards sustainability in India's digital and electric vehicle revolution by 2040. This approach emphasizes proactive engagement, technology-driven efficiency, and policy advocacy for environmental and socio-economic well-being.

FUTURE TRENDS

Future trends in the EV sector reveal that there will be approximately 3.5% growth in the market share in 2024. The significant growth is because of the Government initiatives such as the FAME scheme, which provides subsidies to people purchasing EVs. The market is also set to welcome a lot of new EVs from different automobile companies catering to various market segments including budget friendly EVs as well as high end luxury EVs. The pricing has been competitive over the years because majority of the automobile companies are trying to enter into the EV market and get the competitive advantage over the other market players. Therefore, the domestic EV market is expected to grow at an annual CAGR (Compound Annual Growth Rate) of 49% between 2023 and 2030, with annual expected sales growing more than 10 million by 2030. EVs shared

18% of the Total sales of vehicles in 2023. Therefore, such positive trends suggest that there will be a significant growth in the market and the market is expected to expand more in the coming years.

CONCLUSION

By focusing on these strategies and leveraging governmental initiatives and schemes, stakeholders can effectively contribute to paving a green path towards sustainability in India's digital and electric vehicle revolution by 2040. This approach emphasizes proactive engagement, technology-driven efficiency, and policy advocacy for environmental and socio-economic well-being.

High levels of investment across the stakeholders are expected to create a better market for EVs with multiple advantages such as reduced trade deficits, reduced urban air pollution, and lower environmental impact. It can be concluded that there are opportunities and challenges in achieving the goals highlighted in this article. However, emphasis has to be placed on the grid integration for EVs. Government policies will help bolster the future of EVs in India and to develop a regulatory and market structure that will take the economy on the high road to an electric future.

ARTICLE NO – 10

SECURING INDIA'S DIGITAL FUTURE: EXPLORING DATA PRIVACY, SECURITY, AND INTELLECTUAL PROPERTY RIGHT IN CYBER ERA

INTRODUCTION

Indeed, India's meteoric rise as a global digital force testifies to the unexampled transformational power of technology in reshaping economies and societies. With an ever-increasing population embracing the use of digital technologies, the number of internet users in the country has risen tremendously, as have mobile connectivity and digital transactions, thus propelling it toward a digital-first economy. The Telecom Regulatory Authority of India reports that India has more than 700 million internet users, making it the second-largest online market in the world, after China[209]. The pervasive use of smartphones and easily affordable data plans have further fueled the digital revolution, thus bridging the online gap in services between urban and rural areas. However, with this digital boom, India is facing a host of problems related to data privacy, cyber security, and intellectual property rights. Of late, reports of data breaches and cyber-attacks have brought to the fore the vulnerability of India's digital infrastructure and the protection of sensitive personal information. For instance, the massive data breach at a leading Indian online marketplace exposed the personal data of millions of users, thereby highlighting the pressing need for robust measures to protect data. Online piracy and copyright infringement pose major challenges to the protection of intellectual property rights in the digital space, thereby impacting content creators, businesses, and the economy at large. As India charts its course toward a digital future, these challenges are required to be dealt with if the resilience and sustainability of its digital ecosystem are to be ensured. Convergence of digital technologies, artificial intelligence, block chain, and the Internet of Things presents tremendous opportunities for innovation and economic growth. However, the exploitation of these technologies with data privacy, fortification of cyber security defenses, and protection of intellectual property rights will require a multi-pronged strategy involving stakeholders from government, industry, academia, and civil society.

[209] Telecom Regulatory Authority of India, "The Indian Telecom Services Performance Indicators," TRAI, accessed May 25, 2024, https://www.trai.gov.in/sites/default/files/PI_Report_Q4_2023.pdf (last visited May 14, 2024)

In this backdrop, the Indian government has taken several initiatives to enhance the digital infrastructure of the country and minimize the cyber risks. Notable among them is the launch of the National Cyber Security Strategy and the creation of the Cyber Coordination Centre to increase cyber-resilience and to create collaboration between the various stakeholders. Moreover, the proposed Personal Data Protection Bill has promised to provide a comprehensive legal framework for safeguarding personal data and the rights to privacy of the citizens of India. However, effective implementation and enforcement of these provisions still remain important challenges for India to secure its digital future.[210]

India's digital transformation presents an immense amount of opportunities and challenges on its path to emerge as a global leader in the digital world. At the same time, protection of data privacy, fortification of cyber security, and protection of intellectual property rights hold immense significance to build an inclusive and resilient digital ecosystem. India could take on these challenges and finally emerge as a beacon of digital innovation and excellence globally through collaborative efforts and strategic interventions.[211]

Data Privacy

In the modern digital environment, the proliferation of digital technologies has thrown open a totally new era of data utilization, promising unparalleled chances and challenges of the same tenor—especially with regard to concerns over privacy. Exponential growth in the collection, processing, and utilization of personal data has elicited the urgent need for robust data protection measures. With this in consideration, India has taken a leap in this direction by the introduction of the Personal Data Protection Bill—a landmark in its regulatory approach to data privacy.[212]

The Personal Data Protection Bill is a concerted attempt at instituting an all-inclusive legal regime toward the protection of privacy rights of persons in the digital space. With the articulation of transparent and accountable principles, it tries to strike a delicate balance between innovation and strict privacy regulations. At the very core of the provisions is the empowerment of an individual

[210] The Digital Personal Data Protection Bill, 2023, *available at:* https://prsindia.org/billtrack/digital-personal-data-protection-bill-2023 (last visited May 15, 2024).
[211] India Leading the Global Digital Transformation Journey, https://www.assocham.org/uploads/files/Digital%20Transformation.pdf (last visited May 14, 2024).
[212] Credited Responses: Democracy and Social Media 2035, https://www.elon.edu/u/imagining/surveys/xiii-2021/improving-toxic-online-forums-2035/credit/ (last visited May 14, 2024) .

with greater control over his or her personal information, which will reduce the concerns surrounding data ownership, consent, and issues of privacy.

In the digital age, personal data has become something worthwhile; it is a driver for data-driven industries like targeted advertising, personalized services, and predictive analytics. But while the responsible use of data promises great innovation and experience improvements to users, it also leads to fundamental concerns about privacy violations and a lack of control over the use of data. The Personal Data Protection Bill makes an effort to deal with this by laying clear guidelines on collection, processing, and storage of personal data in order to instill confidence in individuals with regard to the protection of their right to privacy.[213]

But amidst the laudable intents of the Personal Data Protection Bill comes the gigantic challenge of balancing innovation stimulation with the need to enforce tough privacy rules. This makes it imperative, as businesses scramble to comply with the requirements and individuals work through the minutiae of data consent and rights, to critically review the implications this bill has on various stakeholders.

Elaborating on the problems and opportunities of data privacy, it is well worth a detailed analysis of the provisions of the Personal Data Protection Bill and its probable impacts on the business and its different stakeholders. Delving into the intricacies of the bill, such as the enforcement mechanisms, compliance requirements, and ramifications on data-driven industries, one can easily gain a comprehensive understanding of the present regulatory landscape relating to data privacy in India. This analysis provides the critical foundation for informed decision-making and proactive involvement with the moving dynamics of data protection in the digital era.[214]

Cyber Security

The fast-evolving digital landscape in India has brought forth cyber security as one of the important cornerstones of the nation's digital strategy, underlining the critical importance of cyber security in securing the integrity and resilience of the country's digital infrastructure. The increasing frequency and sophistication of cyber-attacks underline the need for a holistic approach towards cyber security that helps mitigate risks effectively. Strengthening cyber security policies is the bedrock of the defensive posture that India has adopted to protect itself against the fast-emerging

[213] The positives of digital life**, https://www.pewresearch.org/internet/2018/07/03/the-positives-of-digital-life**

[214] Cybersecurity-Privacy-And-Artificial-Intelligence-In-Health-Data-Advancements And Challenges, https://uwaterloo.ca/cybersecurity-privacy-institute/sites/default/files/uploads/documents/cybersecurity-privacy-and-artificial-intelligence-in-health-data-advancements-and-challenges-conference-ebook.pdf

tide of cyber threats. Strong policies, worked out following comprehensive risk assessments and threat intelligence, provide the framework for proactive cyber defense measures. With a clearly defined guideline for data protection, incident response, and risk management, these policies equip organizations with the capability to enhance their cyber resilience and quickly respond to new threats. Another strategic imperative for India's cyber security strategy is fostering public-private partnerships. The changing nature of cyber threats requires both the public and private sectors to come together and share their expertise and resources. PPPs enable pooling of resources, knowledge, and best practices for coordinated responses to cyber threats. By forging alliances with industry stakeholders, government agencies can leverage private sector innovations and insights, thus enhancing the effectiveness of cyber defense measures and staying ahead of threats. Another important aspect of India's cyber security strategy is investing in state-of-the-art technologies. Rapidly advancing technologies create new opportunities and challenges for cyber security in equal measure. Emerging technologies like Artificial Intelligence, Machine Learning, and Block Chain present innovative solutions for threat detection, incident response, and data protection. By tapping into the power of these technologies, India can beef up its cyber defense capabilities to adapt to the dynamic threat landscape.[215]

A proactive approach to cyber security, characterized by continuous monitoring, threat intelligence sharing, and rapid incident response capabilities, is needed by the evolving nature of cyber threats. Threat actors are constantly evolving their tactics, techniques, and procedures, making it a point for organizations to be constantly vigilant and agile in their cyber defense efforts. Continuous monitoring of network activity and system logs enables organizations to detect and respond to suspicious behavior in real-time, thereby keeping the impact of cyber incidents to a minimum. Moreover, threat intelligence sharing greatly enhances situational awareness and facilitates a coordinated response to cyber threats. Sharing threat intelligence with trusted partners allows organizations to gain insight into emerging threats and vulnerabilities to proactively mitigate risks and bolster cyber defenses. Public-private partnerships play a big role in facilitating threat intelligence sharing by providing a platform for collaboration and information exchange among the stakeholders. In this context, specific examples of cyber-attacks on Indian organizations can

[215] India's Cyber Security Challenge: Threats and Strategies, **https://www.drishtiias.com/daily-updates/daily-news-editorials/india-s-cybersecurity-challenge-threats-and-strategies.**

be enlightening for understanding the evolving cyber threat landscape. Analysis of recent cyber incidences and the response of the government to such attacks could be enlightening for the stakeholders in understanding the tactics of threat actors and the effectiveness of current cyber defense measures. Moreover, case studies on successful public-private partnerships in cyber security could be best practices to enhance collaboration and resilience to cyber threats. In conclusion, a proactive and collaborative approach toward cyber security will help to fortify the digital infrastructure of India and mitigate the ever-evolving cyber threats. Strengthening the cyber security policies, fostering public-private partnerships, and investing in cutting-edge technologies could help enhance the cyber resilience of India and safeguard the nation's security and economic interests in the digital age.[216]

Intellectual Property Rights in the Digital Age

The digital revolution has indeed induced a paradigm shift in the landscape of intellectual property, bringing with it myriad challenges and opportunities. As digitalization continues to permeate every aspect of creative expression and innovation, traditional methods for the creation, dissemination, and protection of intellectual property have undergone significant transformation, calling for adaptive legal frameworks that can keep up with the shifting digital landscape. One of the most pressing challenges facing the digital era is the rampant proliferation of digital piracy, which jeopardizes the rights and interests of content creators and rights holders. The ease of access and widespread availability of digital content from online platforms have led to the rising incidence of unauthorized copying, distribution, and consumption of copyrighted material. This infringes on the economic value of intellectual property and dampens the incentive of creators to produce new and innovative content. Any attempt to address the scourge of digital piracy will have to involve a multi-pronged attack that incorporates both legislative and technological measures. Strong intellectual property laws and enforcement mechanisms are requisite measures for deterring piracy and protecting the rights of creators. On the other hand, legal frameworks prove relatively ineffective against the problem of digital piracy, mainly because the internet crosses borders and provides anonymity to violators. The implementation of technological innovations in combating digital piracy and securing intellectual property rights proves to be of paramount importance.

[216]Cyber Terrorism As A Global Threat: A Review On Repercussions And Countermeasures, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10803091/

Digital rights management (DRM) technologies, encryption techniques, and watermarking solutions are among the tools available to secure digital content from unauthorized use and distribution. By applying these technologies in digital platforms and channels for content distribution, rights holders are able to exercise better control over the manner in which their intellectual property is distributed.[217]

Most importantly, a culture of innovation should be cultivated because it helps breed an environment that is friendly for intellectual property rights in the digital age. Collaboration among different stakeholders, involving content creators, developers of technology, and legal experts, should be encouraged for developing innovative solutions for content protection and rights management. Moreover, consumer education about the importance of intellectual property and the effects of piracy should be promoted to inculcate a culture of respect for the rights of creators. In India, the changing role of technology in abetting and fighting digital violations calls for a proactively managed approach to enforcing intellectual property rights. By studying the trends of new piracy in cyberspace and the effect of the existing legal regimes, stakeholder entities can identify loopholes and formulate strategies to strengthen intellectual property protection in the digital age. Basically, the protection of intellectual property rights is not only crucial for the pursuit of innovation and creativity but also for ensuring a vibrant digital economy that benefits all stakeholders.[218]

Legislative Efforts and Impact

The legislative landscape of India acts as a landmark for shaping the trajectory of its digital evolution and stands as testimony to the efforts made by the government in addressing modern-day challenges head-on. The introduction of landmark legislations, such as the Personal Data Protection Bill, presents the government's proactive approach towards addressing issues of prime importance in the digital realm. A close analysis of the potential ramifications of these legislative endeavors on businesses and individuals provides valuable insights into the changing regulatory landscape and its implications for stakeholders across the board. The passing of progressive legislation marks a vital milestone in creating an environment most conducive to digital innovation

[217] Transforming Dimension of IPR: Challenges for New Age Libraries, https://nludelhi.ac.in/download/publication/2015/Transforming%20Dimension%20of%20IPR%20-%20Challenges%20for%20New%20Age%20Libraries.pdf

[218] The Way Forward for Intellectual Property Internationally, https://itif.org/publications/2019/04/25/way-forward-intellectual-property-internationally/

and growth. Such laws provide a framework for addressing complex issues, including but not limited to, data privacy, cyber security, and intellectual property rights, and thereby lay the groundwork for a robust digital ecosystem. However, the efficacy of these legislative measures hinges on their actual implementation and enforcement. The government agencies, regulatory bodies, and law enforcement authorities have a significant role to play in ensuring compliance with legal requirements and bringing wrongdoers to book for their wrongs. Authorities enforcing the provisions of such laws rigorously will be able to create a level playing field for businesses, protect the rights of individuals, and uphold the rule of law in the digital domain.[219]

Moreover, such an analysis of the potential impacts of these legislative measures on different stakeholders provides considerable insight into the problems and opportunities linked with the digitization of India. Businesses will need to adapt to the changing regulatory environment by conforming to new legal requirements while at the same time capitalizing on the opportunities arising from such changes through innovation and growth. Individuals have much to gain from advanced data privacy and protection of intellectual property. Government agencies have an important role in ensuring that businesses and individuals are empowered to remain in compliance.[220]

Legislative efforts within the digital domain in India reflect a proactive approach towards dealing with the challenges of the digital age. An analysis of the impact of such legislative measures on businesses, individuals, and government agencies will help stakeholders move better within the dynamic regulatory environment, promote innovation, protect rights, and ensure accountability.[221]

Recommendations

Negotiating the challenges faced in India's digital environment, the formulation of effective recommendations forms a cornerstone in securing the nation's digital future. Drawing from the multifaceted challenges posed by data privacy, cyber security, and intellectual property rights, a

[219] White Paper of the Committee of Experts on a Data Protection Framework for India, https://www.meity.gov.in/writereaddata/files/white_paper_on_data_protection_in_india_171127_final_v2.pdf

[220] Accelerating Digitisation in Healthcare Delivery, https://abdm.gov.in:8081/uploads/Accelerating_Digitisation_in_Healthcare_Delivery_v3_fad6fe700f.pdf

[221] Setting the future of digital and social media marketing research: Perspectives and research propositions, https://www.sciencedirect.com/science/article/pii/S0268401220308082

strategic approach encompassing various dimensions is imperative. This section describes a comprehensive set of recommendations designed to handle these challenges and to create a resilient and innovative digital environment. From enhancing public awareness to promoting international cooperation, each recommendation aims to mitigate risks, drive innovation, and safeguard the interests of all stakeholders in the cyber era. By implementing these recommendations, India can chart a path toward sustainable digital growth and ensure that the country is at the forefront of the global digital economy.[222]

- **Enhancing Public Awareness**: Enhanced awareness is vital for educating the citizens about the importance of data privacy, cyber security, and intellectual property rights. Government agencies, educational institutions, and civil society organizations should come together for developing comprehensive awareness programs. These programs may include workshops, seminars, and digital literacy campaigns targeting different segments of society. More importantly, using social media platforms and traditional media channels can amplify awareness campaigns, reaching and empowering individuals to make informed choices regarding their digital interactions.[223]
- **Strengthening Enforcement Mechanisms:** To strengthen enforcement mechanisms, priority needs to be given by policymakers regarding the allocation of resources to law enforcement agencies responsible for fighting cybercrime and intellectual property violations. This could include enhancing the capacity of specialized cybercrime units and intellectual property rights enforcement agencies. Also, stricter penalties for offenders and streamlining legal processes may act as deterrents against illicit activities. There needs to be a more efficient collaboration among law enforcement agencies, the judiciary, and the relevant stakeholders in the swift and effective enforcement of laws governing data privacy, cyber security, and intellectual property rights.[224]
- **Fostering Public-Private Partnerships:** In this complex digital landscape, public-private partnerships (PPPs) are crucial for addressing complex challenges. PPPs should be facilitated by governments with platforms that enable interaction and collaboration

[222] Securing India's Digital Future Cyber Security Urgency and Opportunities, https://thediplomat.com/2024/01/securing-indias-digital-future-cybersecurity-urgency-and-opportunities/
[223] Why is Cyber security Important?, https://www.upguard.com/blog/cybersecurity-important
[224] Copyright Piracy And Cybercrime: Enforcement Challenges In India, https://www.wipo.int/wipo_magazine/en/2022/04/article_0008.html

between industry, academia, and government agencies. PPPs can be in the form of collaborations on research initiatives, information-sharing platforms, and capacity-building programs. In so doing, PPPs are likely to inspire innovation, improve cyber resilience, and uphold responsible data stewardship. Moreover, tax breaks or grants should be offered to the private sector, thereby encouraging the participation of PPPs that would bring about a sense of responsibility in securing India's digital future.[225]

- **Investing in Technological Advancements:** Investment in technological advancement is crucial in staying ahead of emerging threats and protecting the digital space. Research and development on emerging technologies must be encouraged, in particular artificial intelligence, block chain, and quantum cryptography. These technologies provide innovative solutions for data security, detection of cyber threats, and protection of intellectual property rights. At the same time, private investments in cyber security start-ups and innovation hubs need to be incentivized to spur technological innovation and create a thriving ecosystem of cyber security solutions that can meet unique challenges in India.[226]
- **Promoting International Cooperation:** International cooperation is one of the most critical strategies in combating challenges related to cyber threats and intellectual property infringement, as they have turned into transnational crimes. This suggests that India should take an active part in international forums such as the United Nations, Interpol, and regional cyber security alliances in order to further strengthen collaborative efforts in cybercrime investigation and information sharing. Bilateral agreements with key trading partners would facilitate cross-border cooperation in the enforcement of intellectual property rights and the sharing of best practices. By developing partnerships on the global level, India will be able to take advantage of collective intelligence and resources toward enhancing cyber resilience and protection of its intellectual property assets on the international level.[227]

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[225] Public-Private Partnerships (PPPs): Definition, How They Work, and Examples, https://www.investopedia.com/terms/p/public-private-partnerships.asp

[226] National Technology Day 2024: India now a digitally empowered nation, https://www.tataelxsi.com/news-and-events/national-technology-day-2024-india-now-a-digitally-empowered-nation

[227] Union Home Minister and Minister of Cooperation, Shri Amit Shah addresses inaugural session of the G-20 Conference on Crime and Security in the Age of NFTs, AI and the Metaverse, in Gurugram, Haryana **https://pib.gov.in/PressReleasePage.aspx?PRID=1939173**

- **Conducting Continuous Policy Reviews:** Continuous policy reviews are integral to ensuring the adaptiveness of India's legal and regulatory framework to new and dynamic digital threats, as well as technological change. As part of this strategy, governments should establish mechanisms for the review and evaluation of the existing policy and regulatory regime on data privacy, cyber security, and intellectual property rights on a periodic basis. In fact, this should be done in such a way that viewpoints from government, industry, academia, and civil society are included in the review process. Moreover, the integration of feedback mechanisms and public consultations will be making policy processes of the government more transparent and responsible in order to gain confidence and trust from the stakeholders in the digital governance framework of India.[228]
- **Supporting Startups and SMEs:** Supporting startups and SMEs is a prerequisite for the creation of innovation and entrepreneurship in a digital economy. Governments should implement policies and initiatives that provide support for financial incentives, access to mentorship programs, and incubation support for startups working in cyber security, data privacy, and intellectual property sectors. Additionally, simplifying regulatory procedures and reducing administrative barriers may facilitate the growth of SMEs and encourage their active participation in the digital ecosystem. By nurturing a thriving ecosystem of startups and SMEs, India can harness the potential of homegrown innovations to address complex digital challenges and drive sustainable economic growth.[229]

Conclusion

Securing India's digital future requires a multilayered approach that takes into consideration the complex interplay of data privacy, cyber security, and intellectual property rights. Implementing the recommendations above will go a long way in cementing India's digital resilience, fostering

[228] Digital Transformation and Cybersecurity Challenges for Businesses Resilience: Issues and Recommendations, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10422504/

[229] STATES' STARTUP RANKING 2022 on Support to Startup Ecosystems, https://www.startupindia.gov.in/srf/images/SRF_2022_Result_page/National_Report_14_01_2024.pdf

innovation, and protecting citizens' and businesses' interests in the digital age. This vision, of a safe, inclusive, and innovation-driven digital ecosystem, is realized by the government, industry, academia, and civil society in concerted collaboration. As India marches on to complete the digital transition, concerted efforts are needed in awareness-building, strengthening enforcement, forging partnerships, investing in technologies, promoting international cooperation, conducting policy reviews, and supporting startups and SMEs to shape a brighter future for the country in the digital sphere.

ARTICLE NO – 11

Jamtara: The Mecca of Cyber Crimes

By Ujjwal Prakash[230] and Amreen Bano[231]

Abstract: -

Jamtara is a small district situated on the border of Jharkhand and Bihar. The region, which the British called "Jungle Terai" and which was meant to be well-known for its wildlife, gained reputation entirely incorrectly. Jamtara emerged as a prominent hub of cyber fraud in the early 2010s. The rise of cybercrime in this small district of Jharkhand, India, became noticeable around 2010-2012 when reports of phishing scams and other cyber fraud activities began to increase significantly. They exploited on people's inexperience and lack of awareness of these kinds of online threats.

Jamtara at present is the hub of cyber-crimes being committed not only in India but also in some of the foreign countries. Amidst malnutrition and poverty, this little city is frequently constantly visited by police brigades from different countries. More than 50% of the cyber-crimes today can be traced back to Jamtara. With the rise in cyber-crimes cases being reported, the conviction rate for such crimes has significantly fallen down; due to increased burden on courts and lack of expertise in IT law.

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Introduction: -

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Jamtara emerged as a prominent hub of cyber fraud in the early 2010s. The rise of cybercrime in this small district of Jharkhand, India, became noticeable around 2010-2012 when reports of phishing scams and other cyber fraud activities began to increase significantly.

Several factors contributed to Jamtara's emergence as a cyber fraud capital. The district's economic underdevelopment and lack of employment opportunities drove many local youths towards cybercrime as a lucrative alternative. The rapid proliferation of mobile phones and internet access further facilitated these activities, making it easier for criminals to reach potential victims nationwide.

The notoriety of Jamtara grew as more cases of cyber fraud linked back to this region were reported. Law enforcement agencies from various parts of India began tracing fraudulent activities to Jamtara, leading to numerous arrests and increased media attention. By the mid-2010s, Jamtara had firmly established its reputation as the "Mecca of Cyber Fraud" in India.

The popular Netflix series "Jamtara - Sabka Number Aayega," released in 2020, dramatizes the true events and provides a detailed depiction of how the district became synonymous with cyber fraud. The series highlights the socio-economic conditions and the operational methods of the scammers, bringing widespread attention to the issue.

The study has been accepted to probe the determination of digital fiscal fraud(cyber fraud) in the Jamtara quarter of Jharkhand(the Mecca of cyber fraudsters) the introductory tools & ways which are used by the malefactors and to find out the socio-profitable condition of their social life & find the new gruelling in cybercrime disquisition and to find out the more secure way of digital fiscal inflow, by using check exploration system and work on secondary as well primary data which was related to this study, cybercrime especially fiscal fraud becomes the new gruelling task.[232]

Digital fiscal frauds are within undetermined governance so it becomes more delicate to probe the cases due to other different public as well private sectors of service providers like the telecom companies and the banks are unfit to make the protective system for their guests also. This is the main reason for detainments in cyber-related case examinations and a veritably low conviction rate in cyber-related cases.[233]

Origins and Evolution of Cybercrime in Jamtara: -

[232]Hussain S.A.; Jamtara India: The Hub Of Cyber Crime; https://www.legalserviceindia.com/legal/article-10200-jamtara-india-the-hub-of-cyber-crime.html

[233] ibid

The socio-economic landscape of Jamtara is characterized by high unemployment, limited economic opportunities, and poverty. These conditions have created a fertile ground for cybercrime. Many young people, facing bleak prospects, have turned to cyber fraud as a means of livelihood. The district's rural setting, coupled with inadequate infrastructure and educational facilities, further exacerbates the issue. These socio-economic challenges are a critical backdrop against which the rise of cybercrime in Jamtara can be understood.

The initial wave of cybercrime in Jamtara began around 2010-2012. During this period, reports of phishing scams and other types of cyber fraud started to increase. Early on, the criminals employed rudimentary methods such as posing as bank officials and making phone calls to unsuspecting victims, asking for their banking details under various pretexts. This method proved highly effective, leading to substantial financial gains for the fraudsters and drawing more individuals into the criminal activities.

As cybercrime in Jamtara evolved, so did the techniques employed by the scammers. The criminals became more sophisticated, utilizing advancements in technology and adapting their methods to evade detection. One common tactic involved convincing victims to download screen-mirroring apps like AnyDesk or TeamViewer. These apps allowed the criminals to gain remote access to the victims' devices, making it easier to steal sensitive information such as OTPs, credit card numbers, and bank account passwords. The scammers also began using bulk messaging to reach a wider audience. Messages often contained urgent or alarming information, such as impending service disconnections, to prompt quick responses from the recipients. Once the victims contacted the provided numbers, they were manipulated into divulging their personal information. This method significantly increased the reach and effectiveness of the scams.

In response to the growing menace of cybercrime, law enforcement agencies have ramped up their efforts to combat the issue. Numerous raids and arrests have been conducted, not only in Jamtara but also in other parts of India where similar scams have been traced back to the district. The police have also launched awareness campaigns to educate the public about the dangers of phishing, cyber frauds, and other cybercrimes and how to protect themselves.

Different crimes and their impact: -

Over the years Jamtara has been home to various cyber crimes and its impact has been variable depending on the targets of the fraudsters. Some of such crimes that have gained limelight have been discussed below: -

1. Phishing Scams

- Description: Scammers impersonate bank officials or service providers, calling victims and convincing them to share sensitive information such as OTPs, bank account details, and credit card numbers.
- Method: Social engineering techniques are used to build trust. Scammers often create a sense of urgency, claiming issues like account suspension to prompt quick action.
- Impact: Victims across India have lost substantial amounts of money due to these scams.

2. KYC Update Fraud

- Description: Criminals contact individuals under the pretext of updating their Know Your Customer (KYC) information.
- Method: Victims are asked to provide personal and banking details to supposedly keep their accounts active.
- Impact: This method exploits the widespread lack of awareness about official KYC processes, leading to significant financial losses for the victims.

3. Remote Access Scams

- Description: Victims are tricked into installing remote access software like AnyDesk or TeamViewer, giving scammers control over their devices.
- Method: Scammers pose as customer support representatives and persuade victims to install these applications to resolve fabricated issues.
- Impact: Once the software is installed, criminals can access and steal sensitive information directly from the victim's device.

4. Fake Lottery and Prize Scams

- Description: Scammers inform victims that they have won a lottery or prize and ask for bank details to process the winnings.
- Method: Victims are often required to pay a small fee upfront for processing, taxes, or legal costs, which the scammers claim is necessary to release the prize.
- Impact: Victims not only lose the initial fee but may also be coerced into providing further financial details, leading to more significant losses.

5. **Online Shopping Frauds**
   - Description: Fraudsters set up fake e-commerce websites or listings on legitimate platforms to sell non-existent products.
   - Method: Victims are lured by attractive deals and discounts. After payment is made, the product is never delivered, and the scammer disappears.
   - Impact: This leads to financial loss for the buyer and erodes trust in online shopping platforms.

6. **Job Scams**
   - Description: Scammers pose as recruiters offering fake job opportunities.
   - Method: Victims are asked to pay an upfront fee for job placement services, training, or other related costs. Often, the scammer collects the fee and disappears.
   - Impact: Besides financial loss, victims suffer emotional distress and wasted time in pursuit of non-existent job opportunities.

These diverse forms of cybercrime in Jamtara highlight the region's adaptability in exploiting various vulnerabilities, from exploiting trust through phishing to manipulating technology for remote access. Law enforcement continues to battle these crimes with mixed success due to their evolving nature and the socio-economic factors driving them.

Recent Cyber Frauds committed throughout the country: -

Cybercrime in numbers[234]

According to the National Crime Records Bureau, a total of 52,974 cases of cybercrime were registered in 2021, up from 50,035 in 2020, 44,735 in 2019 and 27,248 in 2018.

In 2021, around 60 percent of cybercrime cases were found to be linked to fraud followed by sexual exploitation (8.6 per cent) and extortion (5.4 per cent), the NCRB data show.

With the growing use of internet, the threat of cybercrimes increases daily. India being a developing country is very prone to such crimes. There has been a notable number of cyber crimes in the past years, the overview of which has been discussed hereinafter.

[234] The Jamtara Files: Cyber frauds on the prowl from your smartphones to your wallet, with audacity, October 12, 2022
https://www.indiatoday.in/india/story/the-jamtara-files-cyber-frauds-on-the-prowl-from-your-smartphones-to-your-wallet-with-audacity-2284516-2022-10-12

In 2023, HDFC Bank faced a major phishing scam where fraudsters impersonated bank officials via email. These emails contained links to fake websites designed to capture the recipients' login credentials and OTPs. As a result, numerous customers experienced unauthorized transactions and substantial financial losses. In response, HDFC Bank collaborated with cybersecurity firms to trace the origin of these emails and issued warnings to educate customers about phishing attempts, emphasizing the importance of not sharing sensitive information online.

Another notable incident involved the use of deepfake technology in a sophisticated scam targeting a major Indian tech company. Cybercriminals created a realistic video impersonation of the company's CEO and used it during a video conference to authorize a fraudulent transfer of $10 million to a foreign account. The financial team, believing the instructions were genuine, executed the transfer. The fraud was only discovered after the money had been sent. This incident highlighted the growing threat of deepfake technology and prompted the company to implement stricter internal verification processes to prevent similar occurrences.

UPI-related frauds also surged, particularly those involving QR codes. In these scams, fraudsters convinced victims to scan QR codes under the pretext of receiving money. Instead, scanning the code authorized payments to the fraudsters' accounts. This form of fraud led to significant direct losses from victims' bank accounts. In response, banks and payment platforms increased their efforts to educate users about the dangers of scanning unknown QR codes and emphasized the need to verify transaction details before proceeding.

Job recruitment scams have become another major issue. Cybercriminals created fake job recruitment websites and LinkedIn profiles, offering high-paying positions at reputable companies. Job seekers were asked to pay a "processing fee" for their applications, only to find out later that the job opportunities were nonexistent. This led to financial and emotional distress for many victims. Law enforcement agencies intervened by shutting down the fake websites and profiles, while companies issued public advisories to inform people about their legitimate recruitment processes.

Fake investment apps have also been a significant problem. Fraudsters developed and promoted apps promising high returns on investments. Users were lured into investing large sums of money, which were then stolen by the scammers. Thousands of investors lost their savings, which led to public outrage and demands for stricter regulation of digital financial services. In response, the Indian government and financial regulatory bodies launched investigations and took down several

fake apps. They also ramped up public awareness campaigns to educate people about verifying the authenticity of financial apps before investing.

Cryptocurrency scams have similarly targeted Indian investors. Cybercriminals created fake cryptocurrency exchanges and ICOs (Initial Coin Offerings), promising high returns on investments in new digital coins that were entirely fictitious. Many investors were duped, resulting in substantial financial losses. The Securities and Exchange Board of India (SEBI) issued warnings and began collaborating with cybersecurity experts to track and dismantle these fraudulent platforms, emphasizing the need for investors to exercise caution and conduct thorough research before engaging in cryptocurrency transactions.

These case studies illustrate the diverse and evolving nature of cyber fraud in India. They underscore the importance of vigilance, robust cybersecurity measures, and continuous public education to effectively combat these sophisticated scams.

Preventive Measures an Individual Should take: -

Don't-partake-in-Sensitive-Bank-details

This is one of the most common preventives we can take to help ourselves from scammers. generally, scammers ask for bank or ATM card details by saying this your card will be blocked in many days, we've to modernize your details in this way, they maraud your plutocrat. To help these kinds of swindles you should not partake in any particular bank or ATM details with anyone. However, you must visit.

Don't-partake-in-OTP

This is one of the most common miscalculations people do by participating in the OTP with someone. The OTPs are made up to cover the client's particular details but if you are giving some arbitrary person your OTP also that person has easy access to steal your identity as well as money. However, tell them to shoot a proper Dispatch from their sanctioned ID by furnishing complete information regarding the matter, if anyone asks you for that.

Strong-watchwords

People use veritably weak watchwords for their social accounts and websites like (1234) which is fluently accessible for hackers to transgress it. Also, these hackers steal your identity and account as well and use it for their particular benefit without your knowledge which is fully illegal. We should make our website words stronger include (upper and lower) rudiments or indeed the (@#,) symbols.

Legal-conduct

There are colourful laws made against cybercrime, swindles, and fraud in the IT Act and IPC independently. For offenses like Hacking, theft, cyberbullying, data theft and illegal law tempering there are some of the major laws comes under Section 66[235](Computer- related offenses), cover against identity theft (S.66C)[236] or cheating by impersonating online (S.66D)[237], Section 43[238] (Penalty and Compensation for damage to the computer, computer system, etc) remedies against data theft, hacking, contagion attacks and fiscal frauds under section 46[239] of IT Act. Cases of forging a credit or disbenefit card or indeed copying a mobile SIM with dishonest or fraudulent intent to beget unlawful loss or unlawful gain could be fulfilled under IPC vittles' (S.463 to.471 IPC). According to NCH, in case of fraud deals a consumer should lodge a First Information Report (FIR) or make a police complaint, or to Cyber Cell if the company isn't traceable. To register a complaint with NCH you can call on1800-11-4000 or 14404, or you can also shoot an SMS.[240]

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Conclusion: -

Jamtara's emergence as the "Mecca of Cyber Fraud" is a complex phenomenon rooted in socio-economic challenges and the rapid adoption of digital technology. The district's evolution from a relatively obscure region to a notorious hub of cybercrime underscores the need for comprehensive strategies that address both the immediate criminal activities and the underlying socio-economic issues. Through sustained law enforcement efforts, public awareness, and socio-economic development, it is possible to mitigate the impact of cybercrime and offer alternative opportunities to the youth of Jamtara.

To effectively combat the cybercrime epidemic in Jamtara, a multi-faceted approach is essential. Law enforcement agencies must continue their efforts to dismantle the networks of fraudsters through coordinated raids and arrests. These operations should be coupled with advancements in cybersecurity technology and forensic methods to track and prevent cybercrimes more effectively. Additionally, cross-border cooperation with international law enforcement can help tackle the

[235] THE INFORMATION TECHNOLOGY ACT, 2000
[236] Ibid
[237] Ibid
[238] Ibid
[239] Ibid
[240] Hussain S.A.; Jamtara India: The Hub Of Cyber Crime; https://www.legalserviceindia.com/legal/article-10200-jamtara-india-the-hub-of-cyber-crime.html

global dimension of these scams, ensuring that perpetrators cannot easily evade justice by operating from remote locations.

Public awareness campaigns play a crucial role in this fight. By educating citizens about the common tactics used in phishing scams and other cybercrimes, individuals can be better prepared to protect themselves from becoming victims. These campaigns should utilize multiple platforms, including social media, television, and community workshops, to reach a broad audience. Emphasizing the importance of digital literacy can empower people to use technology safely and responsibly.

However, addressing the root causes of cybercrime in Jamtara requires more than just policing and education. Socio-economic development initiatives are vital to provide the youth with viable alternatives to engaging in illegal activities. Investment in education, vocational training, and job creation can help uplift the community and reduce the allure of quick money through cyber fraud. Creating an environment where young people have access to quality education and employment opportunities can shift the focus from cybercrime to legitimate means of livelihood.

Moreover, infrastructure improvements, such as better internet access and technological resources, can be leveraged to foster innovation and entrepreneurship in legitimate fields. Encouraging startups and businesses that can thrive in a digital economy can provide sustainable economic growth for the region. This transformation requires collaboration between government agencies, private sector partners, and non-governmental organizations to ensure a holistic and inclusive approach.

In conclusion, while Jamtara's reputation as the hub of cyber fraud presents significant challenges, it also offers an opportunity to implement comprehensive strategies that address both the symptoms and causes of cybercrime. By combining law enforcement, public education, and socio-economic development, it is possible to create a safer digital environment and provide the youth of Jamtara with the tools and opportunities they need to build a better future. This multi-pronged approach not only combats current criminal activities but also paves the way for long-term, sustainable change in the region.

ARTICLE NO- 12

Legal Frameworks and Policy Considerations for the Digitalisation of Sustainable Infrastructure: Emphasis on Green Energy, Transportation, and Urban Planning

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Abstract

The digitalization of sustainable infrastructure integrates advanced digital tools and technologies to optimize natural resource use, enhancing efficiency and accessibility. This transformation is pivotal for India's goal to become a developed nation by 2040 through sustainable growth, focusing on green energy, efficient transportation, and strategic urban planning. This approach fosters inclusivity and equity, ensuring non-discriminatory progress across class, caste, gender, and race while building a sustainable future.

In green energy, the reliance on costly fossil fuels highlights the need for alternative energy sources. Digital technologies facilitate the efficient management of renewable resources like solar and wind energy. The legal framework includes international agreements, regional adaptations of developed nations' policies, and the establishment of regulations, standards, licensing, and

consumer protection measures. Tax incentives and subsidies are crucial in promoting green energy initiatives.

Transportation in India faces challenges from rapid urbanization and increased vehicle ownership, leading to higher emissions. The adoption of electric vehicles (e-vehicles) and digital technologies is essential for sustainable and energy-efficient transportation systems. Digitalisation can lead to intelligent transport systems, advanced technological solutions for transportation sustainability, and digitized inland waterways. Legal frameworks include international agreements, regional adaptations, modernization programs for vehicles, and laws supporting intelligent transport networks.

Urban planning must evolve to address the pressures of population influx in cities. Digital technologies are crucial for sustainable urban development, providing access to education, healthcare, and other basic necessities. Effective urban planning prevents cities from becoming heat islands and promotes efficient waste management. Legal frameworks involve multinational collaboration, adoption of developed nations' strategies, and mandatory standards for environmental impact assessments at construction sites. The judiciary plays a significant role in addressing environmental pollution, ensuring the right to a healthy environment, and managing industrial pollution. Government awareness programs are vital for public education on sustainable practices.

This paper explores these facets, providing a detailed analysis of the policies and frameworks necessary to support the digital transformation in green energy, transportation, and urban planning.

Key words - Digitization, sustainable infrastructure, Energy efficiency, legal framework

Introduction

Digitalisation of Sustainable Infrastructure refers to the use of technology and digital tools in the integration of sustainable infrastructure, allowing for the efficient and optimal utilization of natural resources. This process enhances the accessibility and user-friendliness of sustainable infrastructure, ensuring a green energy transformation in India through the generation of electricity from sustainable resources like solar and wind. The use of data analytics and other digital technologies can make transportation systems more energy-efficient and safe, as well as manage the heavy traffic in metropolitan cities with the aid of digitalisation. Another crucial component of infrastructure is urban planning; with the increasing rate of rural migration in India, there is a need to develop technology to make urban areas more sustainable by conserving basic amenities through the integration of digital or AI-led control systems. To implement this idea, it is essential to formulate a robust legal framework that includes two aspects: creating policies that motivate individuals and industrialists to actively participate in the digital transformation for a sustainable environment, and enforcing laws that require people to follow government regulations to achieve the status of a developed nation with sustainable measures.Legal framework will be the empirical measures of the idea of digital transformation of sustainable Infrastructure.

Interlinking Digital Transformation for Environmental Sustainability- Envisioning A Developed India by 2040. And Digitalization of Sustainable Infrastructure

Digital transformation in sustainable infrastructure refers to the integration of digital and cutting-edge technology in the formation of green energy based on hydro, solar, wind, etc. This integration extends to enhancing the transportation system and fostering sustainable urban planning. By harmonizing energy, transportation, and urban planning through sustainable infrastructure, India can achieve significant progress towards environmental sustainability by leveraging digital advancements. Embracing digital transformation stands as a pivotal measure in propelling India towards becoming a developed nation by 2040 while ensuring equitable and inclusive growth, free from discrimination based on class, caste, gender, or race, and fostering a sustainable future. Attaining the 2040 development target necessitates the collective engagement of diverse

stakeholders, including government, industry, civil society, students, and others, in shaping digital sustainable infrastructure. In crafting legislation, due consideration must be given to safeguarding data privacy and intellectual property rights of developers who play a crucial role in digitizing infrastructure. Digitalization paves the way for accessible sustainable infrastructure across India, fostering a profound positive impact on society and marking a significant stride towards a safer and greener environment.

Digital transformation has become an integral part of our lives, presenting unique opportunities to address pressing environmental challenges and foster sustainable development. Leveraging the digital revolution for environmental sustainability involves not only technological advancements but also a comprehensive framework that integrates green energy, transportation, and urban planning. By envisioning a developed India by 2040, we can explore the synergies between digitalization and sustainability to create a future that is both prosperous and environmentally sound.

The Role of Digital Transformation in Green Energy

India's 49.1% of energy demand is fulfilled through coal which has a capacity of 205GW[241]. The Indian region does not have the high quality coal which is used for energy production, it costs $35 billion in 2023 data shared by the power ministry. So this is costly and increases the dependence of India over other nations. India's steps towards building green energy plants is beneficial and with the help of digital technologies we can effectively manage the green energy sources. Let see the implication of the digital transformation on green energy-

- Use of cutting edge technology for production of green energy - Digital transformation also focuses on the innovation of the new technologies which can contribute in the sustainable energy generation. India's energy mix includes solar power, which constitutes 16.1% of the total installed capacity, driven by government initiatives and cost reductions, primarily for electricity generation and decentralized applications like solar pumps . Wind energy, at

[241] Power Sector at a Glance ALL INDIA - https://powermin.gov.in/en/content/power-sector-glance-all-India

10.3%, is mostly generated in coastal areas. Hydropower, contributing 11.2%, is generated from major projects in the Himalayan and other hilly regions.[242] Biomass and waste-to-energy, though smaller in share, are crucial for rural energy needs and waste management . These sources reflect India's efforts to diversify and digitalize its energy sector.

- Connection of the on grid solar system - with the access digital infrastructure solar panels can be connected in the on-grid system i.e grid-tied or grid-connected system, refers to a solar power setup that is connected to the public electricity. This well not only generates electricity from household rooftops but it will also provide an extra income to the families who will be connected in this grid system. The cumulative installed capacity for on-grid solar power stands at approximately 49.3 GW.[243] This will reduce the burden of the energy producing companies and a step towards India being a sustainable developed nation by 2040.

- Digital transformation plays a key role in accessibility of green energy - one of the important impacts that can be done by digitizing green energy is increasing the accessibility and affordability of the green energy. This can be achieved by developing tech. Which can minimize the cost of the energy. This aims to develop a sustainable, secure, and competitive market for digital energy services. Key actions include enhancing consumer control over energy use, improving energy efficiency. Digital transformation will develop the user friendly interface, so the green energy resources can easily accommodate the needs of rural India i.e approx 65% of India’s population.

- Better monitoring and feedback mechanism through digital infrastructure - efficiency can be achieved by integrating digital tech with the green energy sources. This will reduce the wastage or leakages in the electricity supply. Digital transformation can help in managing and monitoring the green energy sector; it will positively impact the revenue generation and the development at large.

[242] Energy Statistics India 2023 - https://mospi.gov.in/publication/energy-statistics-india-2023
[243] **Solar Overview - https://mnre.gov.in/solar-overview/**

Legal Framework for digitizing the Green Energy

Legal policies are necessary for the ground implementation of the idea to develop digitized sustainable infrastructure. This will help in gaining people trust on the digitally led green energy sources as it will be backed by the government policies. Here are some policies which will promote investors and other stakeholders to build the green energy plants in the form of hydrogen plants i.e multipurpose projects, dams; solar plants; production of green hydrogen fuel.letus focus on the legal strategies -

- **International agreements and Adoption of developed nation policy with regional variation** - framing policies and laws with considering the international agreement to promote the digitalisation in green energy i.e 1.Paris Agreement: This landmark international treaty, adopted in 2015, requires countries to submit and update their Nationally Determined Contributions (NDCs)[244], which outline their climate action plans, including measures for green energy transitions and digitalisation to enhance energy efficiency and renewable energy deployment. India can also take learnings from the EU Action Plan for Digitalising the Energy System (2022)[245] which aims on the better consumer control, Developing Digital Energy Infrastructure: Promoting smart grids and data-sharing platforms to integrate renewable energy sources effectively, Enhancing the security of energy networks against cyber threats.. This will provide India the fundamentals to form policy upon and issues to consider while framing laws.

- **Regulations, Standards Licensing and Permitting** - one of the important tasks of laws is to frame the guidelines and regulation to avoid any unwanted consequences. These regulations force producers to adopt digital technology in the energy sector for efficient production. Regulation will Set standards for the interoperability and cybersecurity of

[244] Paris Agreement - https://unfccc.int/process-and-meetings/the-paris-agreement
[245] Digitalisation of the energy system - https://energy.ec.europa.eu/topics/energy-systems-integration/digitalisation-energy-system_en

digital systems in the energy sector. Digitizing the license and permit process to ensure the ease of doing business for the industrialist to invest in the green energy sector. Digitalized process of the renew of the permits by the process will increase the productivity of companies. Stakeholders associated with green energy production govt. Can ease down the stringent laws to develop the capacity of energy generation

- **Tax Incentives and Subsidies**: Providing tax breaks or credits for companies that invest in digitisation projects within the green energy sector and Providing incentive or PLI(Production Linked Incentive) to green energy producers who are making efforts for the digital transformation in the green energy sector. Government can also provide grants Offering financial support for research and development in digital technologies for renewable energy. This will create a positive impact in society as these initiatives will reduce the price of the green energy. Apart from this it will increase its market competitiveness and its demand in the energy market.

- **Governance and Oversight -** Regulations regarding Intellectual property rights for developing the cutting edge tech in green energy integrating digital transformation. Regulatory Bodies: Establishing or empowering regulatory bodies to oversee the digitalisation of the green energy sector. A central nodal agency can be established to facilitate the green energy open access system, ensuring a smooth and transparent process for consumers to access renewable energy. To Implement this, concerned department officials should be equipped with necessary skills and a digitally integrating system of all concerned departments.

- **Consumer Protection -** Mandating transparency in the operation of digital technologies to protect consumer interests.through the installation of the smart meters and implementing smart grid technologies that enhance the grid's reliability, efficiency, and security this will reduce the corruption to negligible. Another component of consumer protection is Dispute Resolution: Providing mechanisms for resolving disputes arising from the use of digital technologies in the energy sector. By these efforts, the burden of judiciary will be reduced and help in the speedy trial of the matters related to it.

- **Forming Policy to adopt the green hydrogen as a fuel -** Green hydrogen is hydrogen produced using renewable energy sources, offering a clean, sustainable alternative to fossil fuels**.** the production of green hydrogen which is considered as the future fuel. petroleum is hazardous for our environment through carbon emission which indirectly also impacts human health which is an important resource for development. Digital transformation will innovate new vehicles that can be run on hydrogen fuel.

Advancing Transportation Through Digital Innovation

In India, the transport sector is a significant contributor to carbon emissions. In 2020, it emitted approximately 272 million tones of CO2, with road transport accounting for over 92% of these emissions. This sector also represents around 14% of the country's energy-related CO2 emissions, making it the third-largest greenhouse gas emitter in India[246]. The rapid urbanization and increasing vehicle ownership are driving these emissions higher. This shows the need to adopt e-vehicles and digital technologies for efficient energy consumption and sustainable transportation. Let's discuss the role of digitalization in the transport system -

- **Digitalization will help in building an intelligent transport system** - Intelligent Transport Systems (ITS) refer to the application of advanced technologies like information and communication technology (ICT), artificial intelligence (AI), and the Internet of Things (IoT) to improve the efficiency, safety, and sustainability of transportation networks. It will fulfill the communication gap between vehicles, infrastructure and other road users to enhance safety and traffic management. By promoting E- vehicles safety and environment concerns can be addressed. ITS also play a pivotal role in the effectiveness of the public transport system as well, it will reduce no. of vehicles used and better traffic management with low carbon emission.

[246] India transport energy outlook - https://www.ceew.in/publications/india-transport-energy-use-carbon-emissions-and-decarbonisation

- **Development of cutting edge technology for transportation sustainability** - EV demand in the market is increasing as it has low maintenance cost, efficiency and safety then regular petroleum vehicles. Funds including America's Rocky Mountain Institute (RMI) and Bezos Earth India say that by 2030, EVs could account for more than two-thirds of the global automobile market. Sales of petrol-diesel cars were at their peak in 2017. By the middle of this decade, there will be more scrap than new petroleum vehicles sold. Within the EV sector continuing evolution to develop e-vehicles that are AI driven considering safety as the first priority. Digitization contributes in the development of the commercial e-vehicles i.e truck, Buses and public transport as well.

- **Focus on Rail transport** - Approximately 90% of India's railway network is electrified. According to PIB, the carbon emissions from diesel locomotives are significant. In 2021-22, the Indian Railways consumed about 1.46 million kiloliters of diesel. This consumption has been declining as electrification progresses, driven by the goal to achieve full electrification and net-zero carbon emissions by 2030. Digitization in the rail network plays a crucial role as it enhances efficiency and safety through real-time monitoring and communication systems. It enables predictive maintenance, reduces delays, and optimizes scheduling. This leads to lower operational costs, improved passenger experience, and significant reductions in carbon emissions by ensuring trains run more efficiently and on time.

- **Building digitized and sustainable inland waterways** - India's inland water transport (IWT) has vast potential, with over 14,500 km of navigable waterways. Utilizing IWT can significantly reduce carbon emissions and alleviate congestion on road and rail networks[247]. Digitalization can revolutionize IWT by enhancing navigation safety through real-time data, optimizing route planning, and integrating efficient cargo handling systems. Developing boats and cargo ships which can run on renewable energy and electric propulsion. This shift will boost economic activities, reduce transportation costs, and

[247]The potential for Indian inland waterway and coastal transport development - Dr S C Mishra https://www.seatrade-maritime.com/opinions-analysis/potential-indian-inland-waterway-and-coastal-transport-development

contribute to sustainable development. Enhanced digital networks and IoT applications can further streamline operations, improve maintenance, and ensure seamless integration with other transport modes.

Legal Framework for digitizing the Transportation

Legal frameworks for sustainable digital transportation ensure standardization and interoperability, enabling different systems to work together efficiently. They enforce cybersecurity measures to protect against cyberattacks and ensure the safety of digital infrastructure. Additionally, regulations promote the adoption of renewable energy sources and green technologies, driving the transition towards environmentally friendly transport. These legal frameworks are also important from a social justice point of view as laws will be formed to ensure the accessibility and affordability to the backward section of the society. Such frameworks are essential for achieving consistent, safe, and sustainable digital transportation networks.

- **International Agreements and Regional Adaptations -** While formulating laws, international treaties and developed nation practices should be taken into consideration for the better results. The Paris Agreement encourages nations to develop and implement sustainable transportation practices as a means to reduce greenhouse gas emissions.. Nations are urged to integrate sustainable transport solutions in their Nationally Determined Contributions (NDCs)[248], which outline their plans to reduce emissions. India had committed to become net-zero emission by 2070.

  International Maritime Organization (IMO) Regulations its MARPOL Convention[249]: Sets standards to reduce emissions from ships, advocating for cleaner fuels and energy-efficient technologies.

[248] (Un)Sustainable Development(s) in International Economic Law: A Quest for Sustainability by **Anna Aseeva**
[249] International Law and Global Governance Treaty Regimes and Sustainable Development Goals Implementation By Alexandra R. Harrington

- **Strict Regulations, Standards and guidelines -** Vehicle Scrappage Policy (2021), Under this policy, vehicles older than 15 years (20 years for commercial vehicles) are required to undergo mandatory fitness tests and failed vehicles are deregistered. Another policy by the Ministry of Road Transport and Highways proposed a Green Tax in early 2021, where vehicles older than eight years will attract a higher tax during registration renewal. These policies will certainly contribute to the reduction of old high-carbon emitting vehicles.new vehicles based on BS-VI are cleaner and more fuel-efficient, contributing to reduced vehicular emissions.

- **Modernizing Vehicles program -** eg. Voluntary Vehicle Fleet Modernization Program **(V-VMP)**: Launched by the Ministry of Heavy Industries and Public Enterprises, V-VMP[250] offers incentives for replacing old vehicles with new, fuel-efficient ones. This program targets commercial vehicles, encouraging fleet operators to upgrade to newer models that comply with BS-VI emission norms. Policy can also be adopted for the personal vehicles providing incentive to people for replacing old vehicles with EV. This can be done by relaxation in registration fee from demand side but initiating production linked Initiative(PLI) and low import duty on the EV components.

- **Laws to implement Intelligent Transport Network -** digitizing traffic control center Use of sensors, cameras, and data analytics to monitor traffic flow and detect congestion. Adaptive Traffic Signals interoperability standards and protection of the system and critical data from the cyber attacks strengthened by the rules. Robust the satellite network for the better coordination not only of road transport but also rail network. It is also important to adopt EV and cleaner fuel i.e biofuels, ethanol blended petrol, Hydrogen fuel to make transportation sustainable.

- **Promotion of public Transport** -With urban populations on the rise, expanding and enhancing the sustainability of public transport systems, such as buses and subways, is essential. This includes increasing the deployment of electric buses (E-buses) and buses running on compressed natural gas (CNG) to significantly reduce carbon emissions.

[250] https://pib.gov.in/PressReleasePage.aspx?PRID=1782743

Digitizing public transport through AI-driven features improves safety measures and boosts energy efficiency, ensuring smooth operations and greater passenger security. E.Sreedharan's work on the Delhi Metro showcases the integration of sustainable transportation with digital solutions. The Delhi Metro system uses advanced digital control systems for efficient and safe operation, reducing urban congestion and pollution while providing a reliable public transport option[251]

- **Introducing policies to support electric cycle (ev-cycle)** - This involves developing dedicated cycle pathways, providing priority in traffic lanes, and offering subsidies and financial assistance to encourage the adoption of ev-cycles. These initiatives not only alleviate congestion but also contribute to lowering overall emissions, creating cleaner and more sustainable urban environments. Cycling not only has environmental and economic benefits but also positively impacts users' health and well-being. To promote cycling, it is crucial to raise awareness and offer incentives to encourage people to adopt bicycles, including e-bicycles, as a sustainable mode of transportation.
- **Policy for utilizing Inland waterways Potential** - Implementing a strategy that integrates river interlinking projects to enhance water transport, alongside establishing a digitized satellite network for improved coordination, represents a transformative approach towards sustainable transportation. By promoting renewable energy sources like electric propulsion, solar energy, and biofuels in maritime operations, the initiative not only alleviates pressure on road infrastructure but also reduces transportation costs significantly. This holistic approach not only promises environmental sustainability but also fosters economic efficiency, ensuring a greener and more resilient future for transportation networks.

Harnessing Digital Technology for Building Sustainable Urban Planning

According to the Periodic Labour Force Survey (PLFS) 2020-21, rural-to-urban migration in India constituted 18.9% of the total migration. This reflects the significant movement of people from rural areas to urban centers in search of better opportunities and living conditions. The rapid influx

[251] Restoring Values: Key to India's Progress - E. Sreedharan

of people into cities has strained urban infrastructure, which has not kept pace with the growing demands. To address this, leveraging digital technologies for better urban planning is essential. This approach ensures sustainable development and guarantees access to basic necessities such as education, healthcare, and food for every individual. By adopting smart planning and resource management, cities can more effectively accommodate incoming populations while enhancing the quality of life for all residents.

Restoring Values: Key to India's Progress

- **Planned development -** Leveraging digital technology to analyze land and other resources is crucial for strategizing sustainable urban development. These digital tools optimize resource allocation, ensuring efficient use of available assets. For instance, they can determine optimal locations for public offices to maximize accessibility for all residents. By tailoring infrastructure development to the specific needs of each city, with consideration for regional variations, digital tools provide essential data and implementation strategies for effective on-ground execution. This approach not only enhances resource efficiency but also fosters equitable and sustainable growth.
- Digital technologies play a vital role in preventing cities from becoming heat islands and in mitigating the other impacts of climate change. One aspect of sustainability involves adapting to climate change effects such as rising sea levels, heat waves, and unpredictable rainfall. Digitized solutions offer effective strategies to address these challenges.For example, digital planning can enhance drainage systems in flood-prone regions, reducing the risk of flooding through optimized infrastructure design. Additionally, employing techniques like wall loop systems can help cool buildings, providing relief during heat waves. These technologies enable cities to better manage climate risks, promoting resilience and sustainability in urban development.
- **Basic necessity services and Waste management** - Digitizing urban planning boosts the efficiency and quality of essential services like food, education, and healthcare. By utilizing data and analytics, cities can optimize resources, improve service delivery, and ensure equitable access, enhancing the overall quality of life and promoting sustainable development. Prominent technology to be used to increase digital interface in the public hospitals and other government offices to reduce consumption of paper and maintain transparency. Urban India generates approximately 62 million tons of municipal solid

waste (MSW) annually. Of this, only 43 million tons are collected, and about 12 million tons are treated, leaving 31 million tons unprocessed and often discarded in landfills[252].Technological advancement is the key player for treatment of urban waste.

Legal Framework for digitizing the Sustainable Urban Planning

- **Multinational collaboration and adoption of developed nations strategies** - The UN SDGs, particularly Goal 11, focus on making cities inclusive, safe, resilient, and sustainable[253]. Achieving these goals by 2030, deliberate discussion with these countries will help India to develop sustainable urban planning. Countries like Singapore, its Smart Nation initiative is a prime example, aiming to create a high-tech urban environment with efficient and sustainable infrastructure[254]. Other cities like Amsterdam, Copenhagen (aim to become carbon neutral capital by 2025) etc. India needs to analyze their methods, challenge in implementation and effective usage of technology for digital transformation. Can be addressed in bilateral relations with them.
- **Policy and regulation** - Mandatory standards should be enforced at every construction site to ensure environmental impact assessments and includes increasing the use of sustainable materials, installing smart meters for energy efficiency. Additionally, mandating rainwater harvesting systems at all new construction sites will contribute to groundwater recharge, promoting more sustainable and responsible building practices.
- Positive step by govt - Framing the Citizen Charter for sustainable urban planning aims to streamline services and enhance transparency through e-governance. It provides clear information about services, mandates digital platforms for applications, and uses smart technologies to reduce wait times and improve efficiency. The charter promotes sustainable practices like paperless transactions and energy-efficient buildings, ensuring that citizens can easily access and benefit from urban planning services while supporting environmental sustainability through digital transformation.

[252]Rags to Riches? The Urban Waste Management in India - Anita khuller https://waste-management-world.com/resource-use/rags-to-riches-the-urban-waste-management-in-india-saga/
[253] https://www.globalgoals.org/goals/11-sustainable-cities-and-communities/
[254] Transforming Singapore Through Technology - https://www.smartnation.gov.sg/about-smart-nation/transforming-singapore/

- **Role of judiciary** - Addressing the environmental pollution, right to a healthy environment, industrial pollution issues caused due to setting up hazardous industries near the urban areas. For eg The case of Indian Council for Enviro-Legal Action vs. Union of India[255] is a landmark judgment by the Supreme Court of India, making several pronouncements like polluters pay principle, remediation and compensation and enforcing strict liability. These should also be implemented at the district level and usage of digital tools for supervision over the industries.
- **Government awareness programs** utilizing animation can effectively educate people about waste segregation at the family level, expediting the process and enhancing the efficiency of waste management. These programs can demonstrate the importance of separating waste, making it easier for waste treatment facilities to process and recycle. Additionally, using solid waste in sustainable road construction, aided by advanced technology, can reduce landfill waste and promote eco-friendly infrastructure development. This holistic approach fosters community involvement and supports environmental sustainability.

Conclusion and Suggestion

In conclusion, the digitalisation of sustainable infrastructure represents a crucial shift towards optimizing resource use, enhancing efficiency, and increasing accessibility. This transformation is vital for India's aim to become a developed nation by 2040 through sustainable growth, particularly in green energy, transportation, and urban planning. Digital technologies enable efficient management of renewable energy resources, support the adoption of electric vehicles and intelligent transport systems, and facilitate sustainable urban development. A comprehensive legal framework, including international agreements, regional policies, standards, and incentives, is essential to drive these initiatives and ensure inclusive and equitable progress across all societal sectors.

- R&D funding in India is currently insufficient, hindering the advancement of sustainable infrastructure. Increasing state funding for startups is essential to foster research and innovation. Adequate financial support will encourage engagement in R&D, crucial for

[255]https://www.informea.org/en/court-decision/indian-council-enviro-legal-action-and-others-petitioners-v-union-india-and-others-0

developing digital technologies that produce accessible green energy, transportation. To achieve sustainable infrastructure, it is imperative to allocate sufficient resources to R&D, as this is key to unlocking innovative solutions and driving progress in this field. Enhanced funding will accelerate the development and adoption of green energy technologies, contributing to India's sustainable growth and development.

- One innovative idea for promoting green infrastructure is leveraging corporate social responsibility (CSR). By guiding and encouraging industrialists to allocate a portion of their CSR activities towards developing affordable green energy solutions, we can significantly increase their contributions to sustainable development. This approach not only supports the generation of green energy but also fosters a collaborative effort between the private sector and the community in building a sustainable future.
- Strengthening environmental impact assessment (EIA) laws is crucial, especially for infrastructure projects in fragile regions of India, such as the Himalayan region and areas near river tributaries. Digitally advanced technology can effectively analyze data related to environmental degradation caused by these projects. Expanding the sectors covered under EIA and introducing laws that ensure the sustainability of infrastructure projects are essential steps. This will help protect sensitive ecosystems and promote environmentally responsible development.
- Ground level Initiatives -The MNREGA scheme could be enhanced through strategic reforms aimed at fostering sustainable local development initiatives. By incorporating projects such as rejuvenation of wetlands, construction of sustainable roads, afforestation drives, and rainwater harvesting, the scheme can empower MNREGA workers with valuable digital technology management skills and significantly improve their livelihood prospects.
- An integrated and well-discussed policy framework with consideration of above legal framework needs to be developed at the central level to ensure uniformity across India while allowing for regional variations to address local geo-socio problems. NITI Aayog, the government’s think tank, will play a crucial role in fostering coherence and providing a deliberative pathway towards a sustainable environment. This approach ensures that policies are both nationally consistent and locally relevant, promoting effective and inclusive sustainable development.

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