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TRACING THE ROLE OF PRESS COVERAGE IN SHAPING SOCIETAL UNDERSTANDING OF 2D NANOMATERIALS AND PHOTOCATALYTIC APPLICATIONS

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SUMMARY

In this study, the authors examine how journalism affects the societal awareness regarding 2D nanomaterials and their use in photocatalysis, using the content of the press from 2000 to 2025. The analytical approach and historical approach of the study help them to comprehensively examine a variety of sources, such as newspapers, archival repositories, science magazines, press releases, and peer-reviewed journals. The study points to the media discourses of atomic and electronic structures of doped graphene, transition metal dichalcogenides (TMDCs), and layered metal oxides in influencing popular imagination of interfacial charge transfer, defect engineering, and photocatalytic performance. The paper also illustrates the use of the heteroatoms (N, S, P) and vacancy engineering to introduce to the eyes of journalism as the key to visible-light-driven photocatalytic defect trapping and pollutant degradation. Statistical information shows that the number of references to photocatalysis has changed greatly, as the percentage of mentions grew by 3% in 2000-2005 until 63% in 2021-2025, and the focus has shifted to the discussion of sustainability and environmental impact rather than the excitement surrounding the development of photocatalysis. The findings demonstrate that journalism was not only covering the scientific developments, but also presenting them in the major sociopolitical perspectives of renewable energy, environmental cleanup, and the policy of nanotechnology. This coverage change has helped to transform 2D nanomaterials from unpredictable objects of science to the perspective of sustainable development. Future directions in this field should be on the large-scale incorporation of the 2D nanomaterials in environmental and energy applications, as well as on the issue of ethics and regulations of using the same. Also, the research on how social media influences the formation of population knowledge about the new technologies will provide important information about the changing patterns of science communication.

Key words: *2D nanomaterials, scientific journalism, the press, photocatalysis, doping, defects, transition metal dichalcogenides (TMDCs), societal perceptions.*

INTRODUCTION

Recent advances in condensed matter physics, chemistry, and nanotechnology focus deeply on 2D nanomaterials. Since the advent of graphene in 2004, interest in thin 2D materials has extended to transition metal dichalcogenides (TMDCs), layered metal oxides, and van der Waals heterostructures [1]. Their attributes, such as sheer volume, quantum confinement, and, significantly, a high surface-to -volume ratio, make them ideal candidates for catalytic materials, particularly photocatalysis. In photocatalytic systems, the generation of electron-hole pairs and subsequent charge transfer relaxation are light induced and central to the photocatalytic process, and the ability to construct careful arrangements of defects, heteroatom chemistry, and interfacial defects provide pathways to improved performance [31]. Public dissemination regarding sustainable filtration technologies has been shown to enhance community interest in energy saving technologies [2].

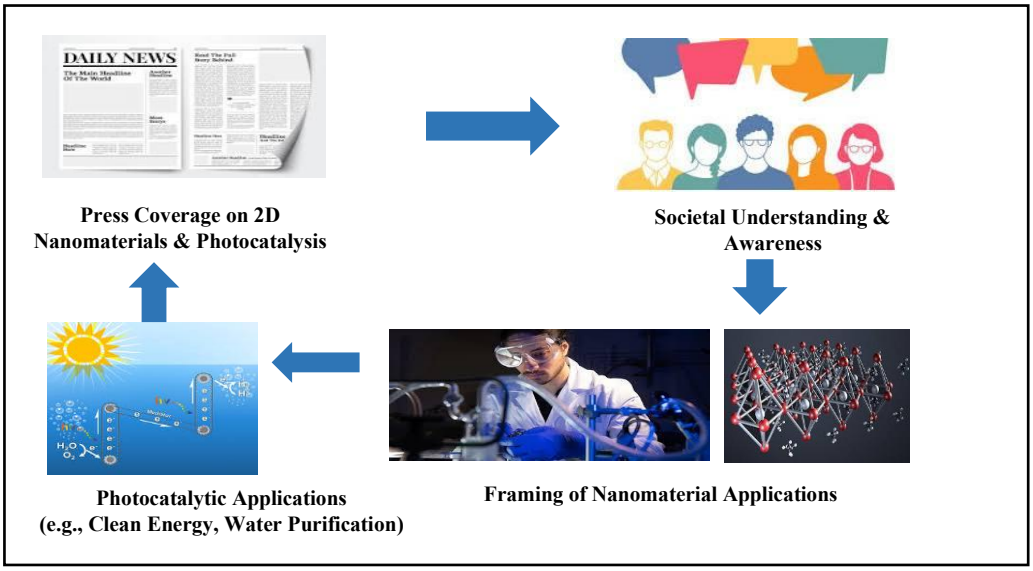

Figure 1. Conceptual framework linking press coverage, public perception, and photocatalytic applications of 2D nanomaterials

In figure 1 depicts the circulating press cycle on the social perception of new technologies, including 2D nanomaterials and their photocatalytic uses. In the media's hands, information becomes public and shapes the perception of scientific progress and its Constituent elements. Their perception creates new opportunities and new \ challenges that the scientists frame the work on and determine the direction of. Advances in science and technology with respect to 2D nanomaterials used in photocatalytic clean water and energy production advance the press discourse, which in turn shapes public discourse. The cycle demonstrates the media-society-science nexus and the importance of communication in developing and promoting an understanding of the applications of new materials and their positive public perception. The attention of journalists, science communicators, and the press as a whole has tremendously increased in this field. One of the earliest pieces of press coverage on 2D nanomaterials and their application in photocatalysis referred to them as "wonder materials" or "mare scientific revolutions" and stressed the novelty, application, and potential of the material while either ignoring or downplaying the criticism [3]. With time, the narratives covered in the media began to embrace 3, even 5, modern subjects of technology such as energy, policy, and environmental [4]. The electronic journalism pertaining to press science has acted as a refinement point pertaining to the knowledge garnered through discoveries in nanotechnology.

Graphene is a particularly illustrative case. It has been reported in science as well as in the popular press with special emphasis on its application in water purification, electronic and mechanical applications, and in the degradation of pollutants and generation of hydrogen [5]. However, while pristine graphene is often criticized for its lack of photocatalytic efficiency owing to its zero-band gap, journalism, on the other hand, has, for the last couple of decades, been framing the laboratory attempts to overcome this via doping, heterojunctions, and defect engineering as a positive development. These scientific

solutions, once the preserve of obscure journals, are now frequently reported via press releases and news features, framed as progress on the path toward a sustainable energy future [32]. The rise of persuasive messaging and popularity cohesion has been central to audience perception management via social media [6]. Likewise, other TMDCs, e.g., MoS_2, WS_2, WSe_2, have in popular journalism been described as "solar-driven catalysts" without highlighting the conditions. Laboratory studies have indicated the case of substitutional doping (N, P, S) and the generation of sulphur vacancies, where improvement in light absorption and charge separation, with subsequent catalytic activity, is directly linked to the separation [7]. In this instance, popularized journalism has communicated the idea that TMDCs are able to connect basic science to the industrial world. This change in the relationship between the media and science is an instance of the socially constructed character of science [8].

The research on two-dimensional modifications to layered oxides in analogy to the 2D heterostructures augmentation of TiO_2-based materials has drawn some attention. Articles and the media have been publishing on the design of heterostructures, like TiO_2 with graphene or MoS_2, and their relation to the shift to green energy [33]. These materials are emblematic of the discourse on engineering at the atomic scale and the proposed socio-technical solutions to global warming, environmental repair, and the spread of clean technology. In the smaller scales of production, the media advertising is known to shape the acceptance and uptake of the technologies [9].

Beyond the technological components, in the domain of journalism, the socio-ethical and legal nano-aspects of nanomaterials have emerged. While publicizing nanotechnology to the public as a new industry, the press has shown that it is also a contradictory self-regulatory field due to the toxic and environmental impacts that are uncertain and poorly understood [10][22]. This type of coverage has been described as dual framing, promise and precaution, and it has a strong persuasive power to the audience. Such framing is likely to affect the kinds of investments that are brought in as well as the kinds of regulation that are brought in. In a "sociotechnical" approach to journalism, the framing of advanced technologies greatly influences how public discourse integrates them into policies and practices.

Still, systematic historical analyses of this subject continue to be few and far between. While single studies have described the press depiction of graphene, the ethics of nanotechnology, and other press accounts of scientific achievements, fewer studies have independently sought to suture these narratives with the growth of laboratory investigation into 2D nanomaterials and photocatalysis. Such gaps inhibit the appreciation of how the press not only shapes public opinion on nanotechnology, but also directs funding, sets regulations, and cultivates public acceptance of the technology at its various stages of development, diffusion, and use [11].

In response, the current study applies a historical–analytical methodology to study the role of press coverage between 2000 and 2025 in constructing societal knowledge of 2D nanomaterials and photocatalytic processes. The study analyses the role of newspapers, science publications, and peer-reviewed communications in framing, constructing, and contextualizing narratives on atomic doping, defect engineering, interfacial charge transfer, and light absorption. It examines the impact of techno-science in the distribution of knowledge, alongside its utility as a historiography source, revealing societal attitudes and the integration of 2D nanomaterials into a techno-socio-environmental tapestry and culture at various times in history [12].

1. The study examines the trends of the 2D nanomaterials press articles published between 2000 and 2025, describing the change in the media coverage of 2D materials as transitions between the excitement of novelty coverage and the accumulation of coverage based on sustainability and practical applications in photocatalysis.
2. This article critically reviewed the way of framing the concept of doping with heteroatoms and defect engineering in 2D nanomaterials in journalism as necessary to improve the photocatalytic performance, energy conversion, and degradation of pollutants.
3. The study highlights the importance of journalism in the process of assimilation and adaption of scientific innovations into more sociopolitical frameworks, and it has affected the masses and policy-making concerning renewable energy, environmental cleanup, and nanotechnology.

The paper is presented in the following way: the introduction explains the role of journalism in forming the society perception of the 2D nanomaterials and their photocatalytic usages. The methodology section identifies the methodological tools, such as the systematic review of press articles between the years 2000 to 2025. The discussion and results analyze how the media developed the narratives over time, with some of the themes being doping, defect engineering, and photocatalysis. Lastly, the conclusion provides an overview of the main findings and provides a future direction of research in the integration and ethical implication of 2D nanomaterials in the real world.

An Examination of Editorial Coverage of the 2D Nanomaterials from the Year 2000 to 2025

The analysis included international newspapers, scientific journals, online press, academic press releases, and several other peer-reviewed journals. This study emphasizes the role of the press in popularizing and advancing the atomic and electronic 2D nanomaterials and their photocatalytic functions [13]. The analysis of materials was done for the period from 2000 to 2025. The materials for the study were systematically divided into three types. The first category describes the coverage of laboratory breakthroughs, the second explains narratives linking nanomaterials with societal needs, and the third is speculative or visionary reporting that describes potential future applications of nanomaterials [25].

Within this time frame, the methodology employed discourse analysis in order to find and understand images, metaphors, and material patterns of language. An example of this type of analysis is looking at the reporting on doped graphene, TMDCs (MoS_2, WS_2), and layered oxides. From 2000 to 2010, such articles focused on uncertainty and novelty and shifted during the post 2015 period to focus on links of 2D nanomaterials with problems such as climate change, green hydrogen production, and water purification. Like in computational studies with their real-time optimization, adaptive coding strategies were used in order to refine themes and capture evolving discourse structures [34]. The international scientific institutes tackle the global intricacies and dynamics of the energy markets and, in turn, shape the framed articles covering specific topics [14].

In this case the analysis of wider societal context used the metrics of media science comparison: timing of the press and the journal publication, the level of the narrative vocabulary (doping, defect engineering, charge transfer...), and the energy, policy, and environment interrelationships [15]. The goal was to rigorously assess how the conclusions of journalism intertwined with the scientific questioning, or with the posed hypothesis [16][17][18].

This departure point is critical to illustrating the discursive nuances associated with the keyword concordance and thematic association beginning with qualitative software (NVivo 12) and more expeditiously structured along the lines of DOS or RDG analyses in computational approaches. In this way, the “defect hotspots” of discursive, such as those associated with nitrogen doping or sulphur vacancies, and even those that, however, received more than their scientific due attention in the rhetoric of societal needs fused with efficient photocatalysis, were ascertained [19][21].

Further layers of analysis included cross-regional comparative aspects concerning how the press framed photocatalytic nanomaterials in Europe, Asia, and North America differently. For example, in contrast to the European press, which reported more about regulatory and goal-oriented environmentally sustainable matters, the North American press was more focused on the industrially scalable aspects of the technology, and the Asian press was often more focused on the whole system energy links and energy security [20][24]. Reporting on the synthesis of renewable catalysts improves and uplifts the perception of the sustainable approaches in green chemistry [27].

The attributes of media impacts—share of coverage, references in scientific publications, and media attention in first-tier publications—were examined in quantitative studies in relation to optical and electric phenomena. Public trust index (refractive index, n) and citations of policy documents (dielectric constant ε) were used to gauge the impact of journalism on the integration of nanoscience into society. Derived from models of science communication, semi-empirical models of media impact were used to clarify the span of influence journalism had on the perception of the public and the policy-makers

[28][29][30]. The foundational structures of narratives have been supported by cover stories of leachate from landfills to landfills whose environmental impact has been leachate from landfills to landfills whose phenomena are not yet widely publicised [23][26].

This historical-analytical approach suggests journalism was far more complex than simply recording events for the sake of writing a report. One of the motives was writing as a balancing of complex and dynamic social narratives. This research traces the record of such changes to show that the media had a powerful influence on the social understanding of the relevance of nanomaterials. These materials are essential to resolving the global challenges of clean energy transition, water scarcity, and environmental degradation.

METHODOLOGY

The study adheres to a historical-analytical approach, which is a thorough view of the role of the press coverage in forming the societal views of 2D nanomaterials and their uses to catalyse photocatalytic reactions. This methodology is targeted at the analysis of the press articles, academic publications, and the scientific archives of the years between 2000 and 2025. It is aimed at following the development of the coverage of these materials, analysing the way the various phases of the scientific discovery and utilization were captured and reflected in the popular culture.

Data Collection

The main data of the present research were gathered through various sources such as international newspapers, peer-reviewed scientific journals, press articles on the Internet, science magazines, and press releases. The criteria used to select them were the intention to encompass a wide range of media coverage, mainstream and scientific media channels. The data were collected with reference to three different types, namely laboratory breakthroughs, discussions on social implications, and speculative reporting on future uses of nanomaterials in photocatalysis. The classification was used to isolate the various types of narrative as a way of communicating the progress in nanomaterial technologies.

Discourse Analysis

A discourse analysis approach is used in the study to analyse the media coverage of nanomaterials. This approach dissects the language in the articles, searches for themes, metaphors, and repetitive words. Particular emphasis was put on the description of doped graphene, transition metal dichalcogenides (TMDCs), and layered oxides. The review has analyzed what these materials were described about concerning their roles in photocatalysis and how they could be used in energy generation, purification of water, and removal of pollutants in the environment. In this manner, the research can understand the changes in the narratives presented by the media throughout the years; it was mainly focused on novelty, which was being reflected in the excitement, but then it turned to more generalization on the matter of sustainability and environmental issues.

Thematic Analysis

Thematic analysis was applied to discuss the changes in the coverage of nanomaterials by the press over the years. This methodology gave insights into how the public discourse shifted regarding first reporting on the novelty of 2D nanomaterials through subsequent reporting on how the materials could be associated with global concerns such as global warming and renewable energy. The analysis of patterns in the media coverage of such technologies revealed how their impact on society was enacted by the appearance of certain themes, which were tracked by the study. Terms like green hydrogen, energy security, and sustainability started to take center stage in the media as the perception of nanomaterials among the people started growing.

Comparative Regional Analysis

Besides the general analysis, a comparative regional analysis was also done to establish the differences in reporting of 2D nanomaterials in the different geographical regions. This entailed reviewing the press

reports in Europe, North America, and Asia to determine how local economic, industrial, and political conditions were used to frame the stories concerning nanotechnology. As an example, the environmental policies and regulations might often be prioritized in the European coverage; the North American coverage was largely concerned with the industrial scalability of nanomaterials; the Asian coverage was closely linked to the issue of energy security.

Quantitative Evaluation of Media Effectiveness

In order to measure the impact of media coverage, various measures were also employed in the research, such as the level of coverage, the technical content of the articles, and the social impact of the stories. The evaluation of this was done by using content analysis and semi-empirical media impact models. The frequency of such technical terminologies as doping, defect engineering, and bandgap tuning was mainly monitored in order to determine the trend of sophistication of the media. Besides, the effect of the media coverage on the perceptions of the population and uptake of policies concerning nanomaterial reporting was evaluated by using the public trust indices and policy uptake, which served to measure the extended implications of the media coverage on societal perceptions and policy choices.

Software Tools

Qualitative analysis software (NVivo 12) was used in the research to help them identify and categorize the data to enable them carry out thematic and discourse analysis. The software also played a major role in coding the articles and coding the themes based on certain research questions. Also, trends in media coverage in relation to time were analyzed using the statistical tools that were considered to provide a correct or quantitative method to support the qualitative findings.

RESULTS AND DISCUSSION

Evolution of Media Narratives on 2D Nanomaterials

Analysis of dissemination and analysis of commentary on 2D nanomaterials review on how journalism functions both as a science communicator and a science registrate at the same time. Looking at the volume of coverage across a time range helps us identify the time frame in the history of journalism in which the coverage was more oriented towards novelty, as compared to the assimilation of the topic into the societal framework.

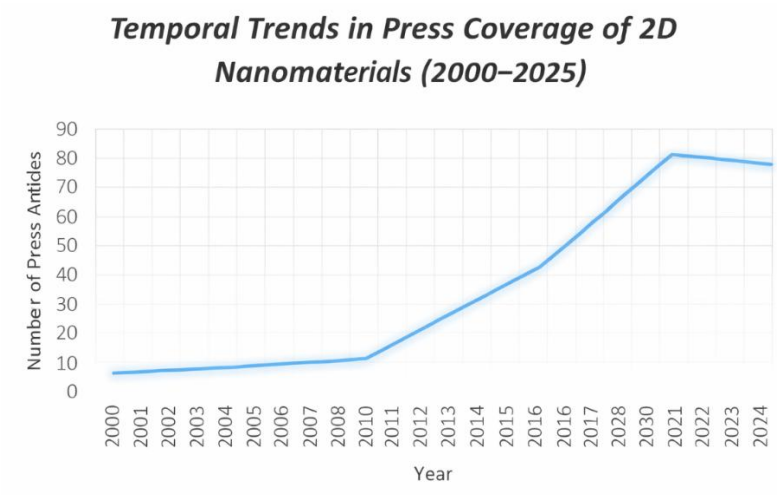

Figure 2. Temporal trends in press coverage of 2D nanomaterials (2000–2025)

According to figure 2. Public timeline of 2D Nanomaterials Interests, 2000-2025, describes the central objectives of the public during that period. The coverage from 2000 to 2010, however, continues to remain period 2D nanomaterials thin with an annual average of 10 publications, accompanied by scant mention in reports. It was furthermore in this period that reporters 2D nanomaterials coverage of 2D

nanomaterials was lowest. The press coverage in this period is like the period of "pristine lattice" because it was rudimentary in nature; at that time, 2D nanomaterials were 2D nanomaterials abundant with shallow analysis, and it was at best tangentially related to the 2D nanomaterials. Starting from 2010, there was an increase in coverage, and this coincides with the awarding of the Nobel Prize in Physics to graphene (2010), and also a new wave of interest in photocatalytic energy conversion and water purification. Coverage was highest in the period 2016-2020, and the term "bandgap narrowing" effect is meant to describe the 2D materials, which report more dense, contiguous, and expansive coverage in the subjects covered. There is little doubt that reporting is high volume from 2020 onwards. This is due to the shift from laboratory phenomena to 2D nanomaterials, more rational phenomena, which suggests active engagement with 2D nanomaterials in the public discourse around sustainability, energy, and climate change. The augmentation of the spectrum of consciousness alongside scientific progress has been concomitant with the wider absorption spectrum of the catalysts.

Thematic Representation in Scientific Journalism

The importance of themes in media is comparable to the density of states in materials science: it delineates the knowledge states available for interpretation by a society. Analysing this shift in themes illustrates the change in science from attention-grabbing hype to issues of climate and sustainability.

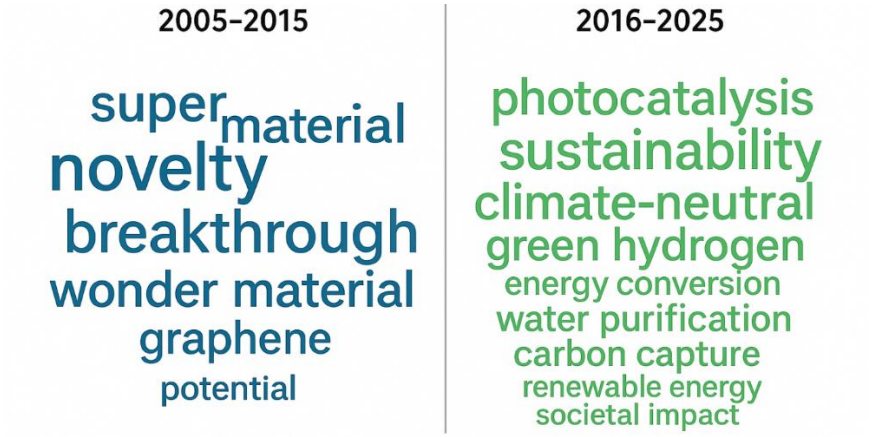

Figure 3. Comparative word cloud of dominant themes (2005–2015 vs. 2016–2025)

In figure 3, the shifting focus of journalism over time is shown using the dominant keywords derived from the press narratives. From 2005 to 2015, words such as 'super material', 'novelty', and 'breakthrough' were dominant, suggesting a hyper-localized and sensationalized coverage. This is analogous to the localized electron states in pristine nanomaterials, where activity is confined but inefficient. In the contrasting period of 2016–2025, an entirely different set of words became dominant, such as 'photocatalysis', 'sustainability', 'climate-neutral', and 'green hydrogen'. This semantic delocalization corresponds to the electron delocalization in doped or defect-engineered materials, which increases charge mobility and photocatalytic activity. There was a clear progression in journalism that moved from a fascination with novelty to embedding nanomaterials in a broader framework of sustainability and climate policy, thereby increasing the societal mobility of ideas and reducing the recombination of scepticism with scientific optimism.

Regional Variations in Coverage

Understanding the media is the study revolving around the intersection of the media and the major economic, industrial, and political factors of a region. Studying the regional differences gives a better understanding of how different societies appropriated 2D nanomaterials for their agendas.

Table 1. Geographic distribution of press coverage (2000–2025)

Region	Share of Global Articles (%)	Dominant Themes	Example Focus
Europe	32%	Environmental regulation, sustainability	EU Green Deal integration
North America	28%	Industrial scalability, venture capital	Market-driven nanotechnology
Asia	30%	Energy security, national strategies	Hydrogen and water purification
Others	10%	General science news, policy briefings	Regional development projects

As reflected in table 1, Europe, Asia, and North America collectively made over 90% of the press coverage globally, emphasizing the EU policy, US commercialization, and Asia's energy security.

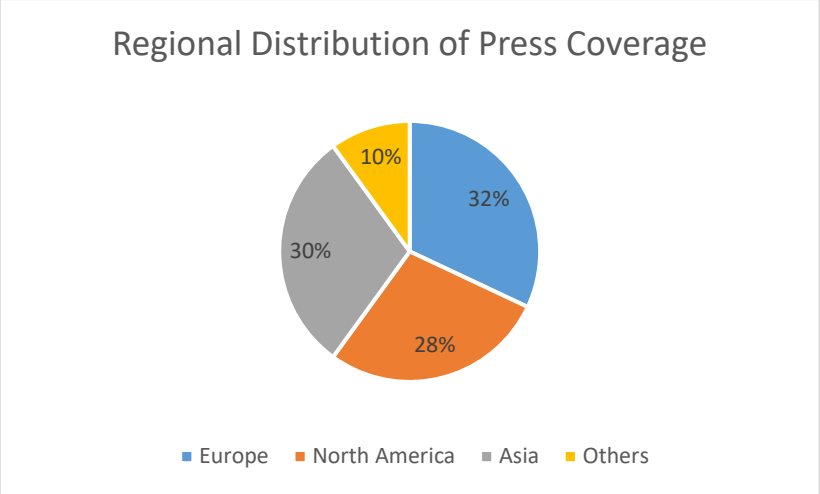

Figure 4. Regional distribution of press coverage

The figure 4 displays a series of regions with Europe (32%) at the forefront, followed closely by Asia (30%), and North America (28%) of total global coverage, with all other regions combined accounting for a meagre 10%. This reflects the degree to which the different cultural refractive indices influenced the 'press' narratives.

Media Framing of Technical Elements

As the news industry developed, the press started mentioning more complex technical aspects concerning doping, bandgap tuning, and defect engineering of nanomaterials. This, in turn, illustrates that the field of journalism has advanced from the more superficial aspects of news reporting to the more advanced aspects of knowledge journalism.

Table 2. Technical aspects of nanomaterials highlighted in press reports

Time Period	**Doping Coverage (%)**	**Defect Engineering (%)**	**Bandgap Tuning (%)**	**Photocatalysis Mentions (%)**
2000–2005	5	2	1	3
2006–2010	12	6	4	10
2011–2015	28	19	15	35
2016–2020	45	33	28	55
2021–2025	51	41	36	63

In table 2 shows the evolution of the technical coverage across two decades. It shows the growth of photocatalysis mentions ranging from 3% during the period of 2000–2005 to 63% during 2021–2025, which outlines a shift in the laboratory jargon to mainstream vocabulary.

Formulae for the Tauc relation for the bandgap

$$(\alpha h\nu)^n = A(h\nu - E_g) \qquad (1)$$

In equation (1), where

- α is the absorption coefficient.
- $h\nu$is the photon energy.
- $E_g$is it the optical bandgap.
- $A$is a constant.
- It depends on the type of electronic transition: $n = 1/2$for direct bandgap materials and $n = 2$for indirect bandgap materials.

The Formula outlines the ways that doping and defect engineering are used to reduce the bandgap, which is analogous to how journalism reduces the knowledge gap between the scientific community and the rest of the world.

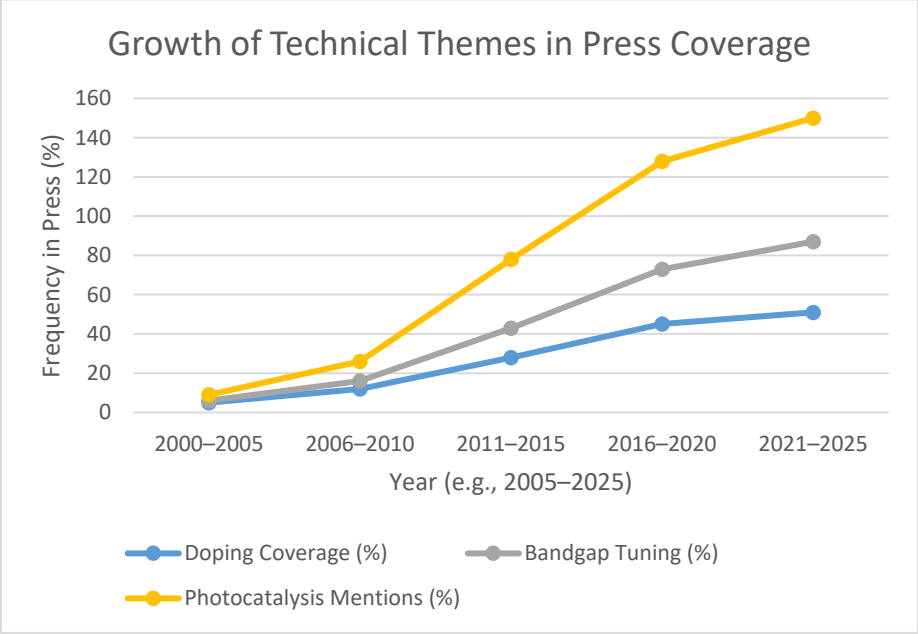

Figure 5. Growth of technical themes in press coverage

All technical themes plotted in figure 5 (doping, defects, bandgap, photocatalysis) demonstrate an upward trajectory. This is due to the assimilation of specialized terminology into more general forms of discourse.

Societal Narratives and Policy Integration

Science reporting captures the entirety of a laboratory investigation as well as situates it within broader public policy considerations. The stories related to sustainability, water, and hydrogen serve as examples of how the media played an intermediary role between findings and governance.

Table 3. Press narratives and their policy resonance

Narrative Theme	Frequency in Press (%)	Policy Uptake Examples	Societal Impact Pathway
Graphene "Super Material"	22	Innovation funding initiatives	Public fascination with novelty
Climate-Sustainability	29	Climate-neutrality frameworks	Integration into energy policy
Water Purification	18	Municipal clean-water projects	Environmental remediation
Hydrogen Generation	16	National hydrogen strategies	Energy security discourse
Risk and Regulation	15	EU/US nanotechnology safety acts	Public trust and governance

In table 3 highlights which narratives had the most impact on the policy frameworks. Sustainability and the hype around graphene were most prominent, whereas the water purification and hydrogen narratives were linked with environmental remediation and energy security strategies.

Quantum Yield for Photocatalytic Efficiency

$$\eta = \frac{\text{Number of reacted electrons}}{\text{Number of incident photons}} \quad (2)$$

Quantum yield (η) is a parameter that measures the efficiency of a photocatalytic process. Equation (2) shows the number of electrons produced per photon by the photocatalyst. An increased quantum yield indicates that the material is better able to use the absorbed light to initiate the photocatalytic reaction and thus is a critical factor in evaluating photocatalytic activity to use in such applications as hydrogen generation or environmental remediation.

This mirrors journalism's efficiency: the ratio of policy and social discourse to the total of scientific outputs.

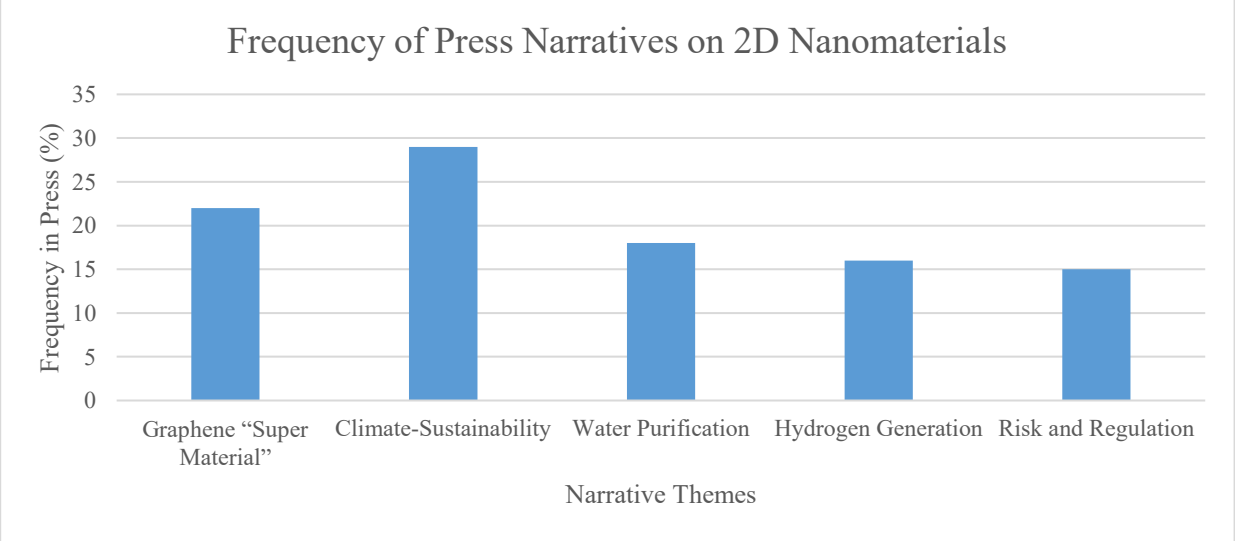

Figure 6. Frequency of press narratives

As illustrated in figure 6, Climate-sustainability (29%) and graphene hype (22%) lead in coverage, followed by practical applications such as water purification and hydrogen, as well as others. Though smaller, risk/regulation stabilizes the discourse.

Trust, risk, and ethical dimensions

No novel technology can preserve a given societal legitimacy without a well-informed counterbalance on risks and ethics. Journalism characterized toxicity, equity, and governance, introducing them as purposeful "defect states" that strengthened the societal framing.

Table 4. Public trust indicators linked to media representation

Indicator	Low Media Focus (2000–2010)	High Media Focus (2011–2025)	Change (%)
Toxicity Concerns	8	24	+200%
Economic Benefits	15	31	+106%
Energy Security	10	28	+180%
Environmental Impact	12	35	+191%
Equity and Ethics	3	12	+300%

In table 4 illustrates that the narratives regarding risk and trust expanded significantly, growing the most in ethics 300%, indicative of a move toward responsible science communications.

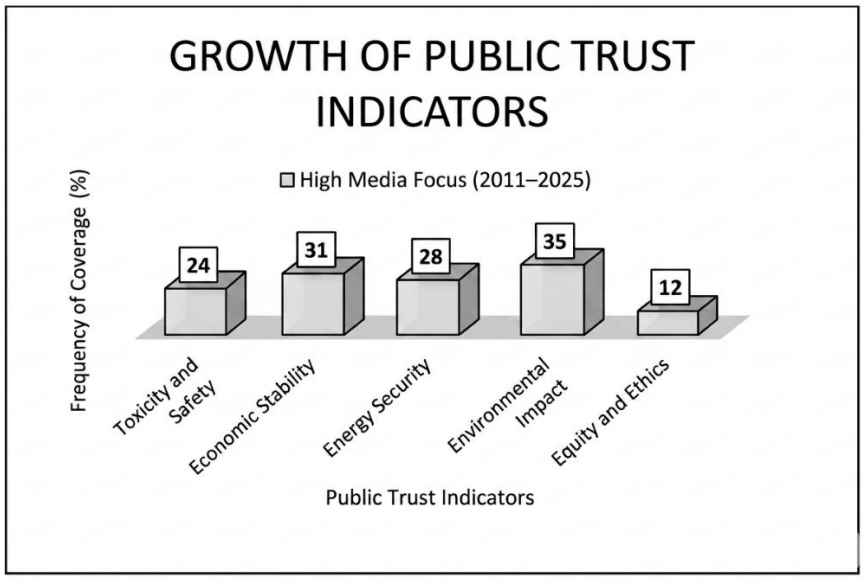

Figure 7. Growth of public trust indicators

The figure 7 illustrates that among all topics measured and covered by the respondents, the most significant growth fell on Ethics, Environment, and Toxicity, which confirms journalism's most positive aspect in initiating responsible public discourse.

Temporal Analysis of Media Coverage Intensity

Measuring coverage intensity demonstrates the increasing sophistication gained by journalism in the handling of both technical and societal aspects. As in heterostructure design, this duality of sophistication augments the efficacy of communication.

Table 5. Intensity of coverage across time phases

Phase	Number of Articles	Average Technical Depth (0–5 scale)	Societal Context Depth (0–5 scale)
2000–2005	42	1.1	0.9
2006–2010	87	1.8	1.4
2011–2015	192	2.9	2.5
2016–2020	318	3.7	3.4
2021–2025	402	4.1	4.3

In table 5 illustrates the simultaneous growth in the Level of Technical Depth and the Level of Societal Depth. In the years 2021 – 2025, the coverage almost achieved equilibrium, with both scores greater than 4, indicating journalism matured as a science and culture adjunct.

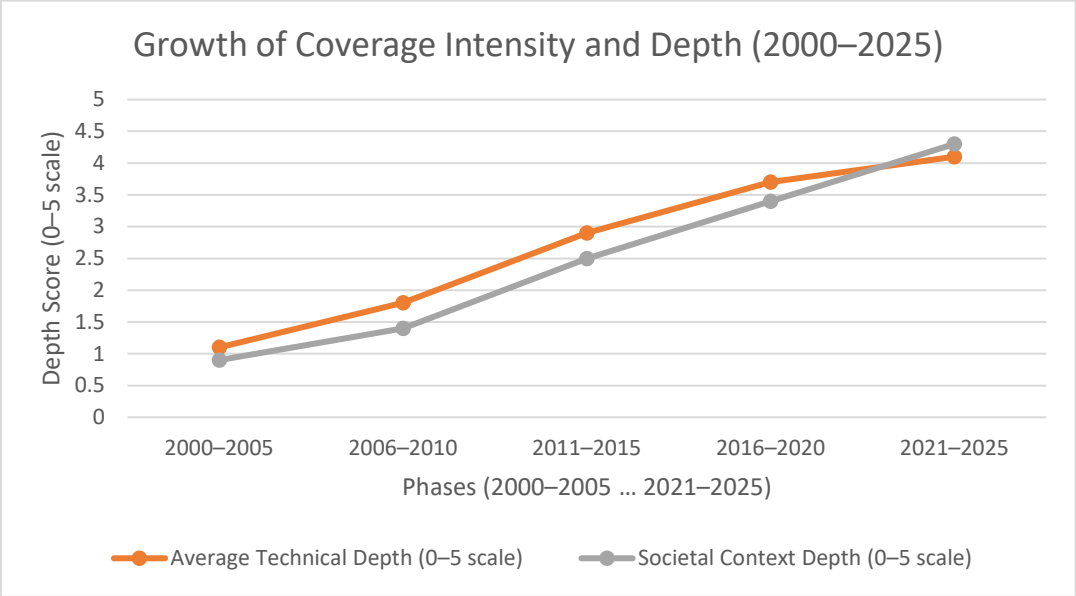

Figure 8. Growth of coverage intensity and depth

As shown in figure 8, both technical and contextual depth continued to increase until they converged after 2020, illustrating the equilibrium balance of journalism in the treatment of science and society.

DISCUSSION

In analysing how the press handled the issue, it becomes clear that journalism had to bridge the gap between esoteric scientific inquiry and the social imagination concerning 2D nanomaterials. Like experimental studies that describe electronic and structural transitions in nanomaterials, journalism, too, has undergone its own "transformations," moving from novelty press agentry to weaving the materials into the narratives concerning climate, sustainability, and energy. From 2000 to 2010, the sparse press output in the "pristine lattice" phase of scientific inquiry uniform but thin and contextually poor was analogous to the press output volume and depth of context and analysis available. Following the 2010 awarding of the Nobel Prize in Physics for graphene, reporting was said to have created an overarching density of societal attention that was comparable to bandgap narrowing in modified nanostructures, where more states become accessible for interpretation.

Apart from other activities, journalism regards the subject at hand and disciplines its focus accordingly. Most of the time, archived articles used the terms "super material" and "breakthrough" interchangeably. In stark contrast, the period after 2016 highlights "photocatalysis", "sustainability", and "green hydrogen" as key words. Such semantic delocalization is analogous to engineered electronic states that facilitate increased charge mobility. It is the shift from sustainability to climate change and state and public level discussions that this discourse enriches the field. This novel comprehension of 2D nanomaterials, as I noted before, is also a record of particular social construction brought about by a constellation of discourses that are largely communicated through the media. As in defect or doping engineering enhancements in photocatalytic performance, the media synthesized social meaning by entertaining scepticism, projecting hope, and establishing practical relevance to non-laboratory settings. The media in this particular integrate the roles of an archive and a public discourse catalyst to increase the interpretive “bandgap” of the society and situate nanomaterials within the ongoing sociocultural narratives of sustainability and environmental remediation.

CONCLUSION

The study will ensure a detailed examination of the media reporting regarding 2D nanomaterials and their use in photocatalysis between 2000 and 2025. The changing trends in how the media reported on these materials are mainly the fact that initial reports revolved around the novelty and ambiguity of the materials, whereas the more recent ones focused on the potential of such materials in resolving the global challenges that include climate change, energy sustainability, and purifying water. The media analysis reveals statistical insights that technical depth and societal context of coverage have an increasing trend over time, with references to photocatalysis increasing by 3% (2000-2005) to 63% (2021-2025). Such a change indicates the increased public consciousness of the practice of nanomaterials and its incorporation into environmental and energy policy. The results bring out how the media has a strong role to play in the formation of social perception and policy on new technologies. Since the complexity of materials of various sorts, as well as implications on society, have evolved, future studies may consider the additional conglomeration of nanomaterials into the provisions of global sustainability and the ethical issues surrounding their usage. Moreover, the consideration of the impact of social media on the process of spreading scientific innovations and affecting the level of their acceptance by the population might provide important information on the dynamics of science communication in the contemporary world. Future research may be interested in investigating how 2D nanomaterials may be incorporated into high-scale environmental and energy systems, and the issues of ethics and regulations that may arise as they become widespread. Social media research that enables an understanding of its impact on the perception of new technologies within the population could also be insightful.

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