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INTEGRATING THE INFORMAL WASTE ECONOMY: STRATEGIC MANAGEMENT AND TRANSFORMATIONAL LEADERSHIP IN HYBRID WASTE SYSTEMS

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Abstract

This study examined the integration of the informal waste economy through strategic management and transformational leadership in hybrid waste-management systems in Nigeria. The study was motivated by the growing volume of waste, inadequate formal waste-management infrastructure, limited recycling capacity, and the insufficient integration of informal waste workers into formal waste-management structures. The study specifically examined the influence of strategic planning and stakeholder collaboration on the integration of the informal waste economy. A quantitative research approach and survey research design were adopted. Data were collected through a structured questionnaire administered to selected stakeholders comprising formal waste-management personnel, private waste operators, informal waste workers, recycling operators, and community representatives. Descriptive statistics and regression analysis were employed to analyse the data, while the hypotheses were tested at a 0.05 level of significance. The findings indicated that strategic planning had a significant positive influence on the integration of the informal waste economy, with an R^2 of 0.465 and a significance level of 0.000. Stakeholder collaboration also had a significant positive influence, with an R^2 of 0.534 and a significance level of 0.000. The study concluded that strategic planning, stakeholder collaboration and transformational leadership are essential for developing effective hybrid waste-management systems. It recommended formal recognition, stakeholder partnerships, capacity development, improved occupational safety, technological innovation, and stronger policy coordination to enhance Nigeria's circular waste economy.

Keywords: Circular Economy, Informal Waste Economy, Nigeria, Strategic Management, Transformational Leadership

Introduction

Nigeria's solid waste management system has become increasingly complex because rapid urbanisation, population growth, changing consumption patterns, inadequate infrastructure and institutional weaknesses have combined to increase the volume and diversity of waste generated in urban and peri-urban communities. Ezeudu, Oraelosi, Agunwamba and Ugochukwu (2021), for example, examined co-production in Nigerian solid waste management and demonstrated the importance of collaborative arrangements involving different actors in the waste-management system. Their work is particularly relevant to the present study because it indicates that sustainable waste management requires interaction between formal institutions, private organisations, communities and informal actors rather than dependence on government agencies alone. Ezeudu and Ugochukwu (2026) explain that informal waste activities contribute to "collection, transportation, sorting, upcycling, resource recovery, and recycling," thereby showing that informal operators participate in almost every major stage of the waste-management value chain. Their study further estimated that informal waste collection of recyclables in Nigeria increased from approximately 2.69 million tonnes in 2023 and could reach about 3.35 million tonnes by 2030. The authors also estimated considerable economic savings and potential national revenue from strengthening the sector. Khanal, Aroyehun, Garba and other collaborators (2023) similarly emphasised the role of informal waste workers in sustainable waste management in Nigeria and Nepal. Their study indicates that informal waste workers perform important functions in waste recovery, disposal and recycling, particularly where formal waste-management infrastructure is inadequate. In the Nigerian context, this means that informal workers should not automatically be regarded as competitors to formal waste-management organisations.

Strategic management is consequently central to the integration of the informal waste economy because integration without deliberate planning may reproduce the weaknesses of the existing system. Strategic management involves identifying long-term objectives, analysing the internal and external environment, allocating resources, coordinating stakeholders and implementing policies in ways that produce sustainable organisational outcomes. Alabi, Salahu, Saka and Abdullateef (2025), in their assessment of strategic mechanisms for solid waste-management policy in Lagos State, found that poor working conditions of private-sector partner operators, administrative changes and residents' non-compliance affected the implementation of waste-management policies. Onungwe, Hunt and Jefferson (2023), in their systematic review of circular-economy transition in Nigerian municipal solid waste management, examined the application of circular-economy principles to Nigeria and argued that Nigeria's large quantity of municipal

solid waste requires a more functional approach to resource recovery and circularity. Ezeudu and Ugochukwu (2026), whose analysis places the informal sector directly within Nigeria's circular-economy value chain. Their findings show that informal actors are involved in collection, transportation, sorting, recycling, upcycling and resource recovery. This suggests that the transformation of Nigeria's waste-management system does not necessarily require replacing informal systems with entirely new formal structures. Instead, existing informal capacities can be improved, regulated and connected to formal markets and institutions. Such an approach would potentially reduce waste entering landfills, increase material recovery, create employment and improve the income-generating capacity of waste workers. The social and behavioural dimensions of waste management are also important. Waste-management performance depends not only on infrastructure but also on household behaviour, community norms, institutional culture and public attitudes. Ojedokun, Henschel, Arant and Boehnke (2022), in a Nigerian study applying the Theory of Planned Behaviour to littering prevention, found that behavioural intention and perceived behavioural control influence littering-prevention behaviour. This finding implies that strategic waste management must address attitudes, social norms and perceived ability to engage in appropriate waste practices. Leadership becomes particularly relevant because transformational leaders can influence organisational and community values, communicate a compelling environmental vision, motivate stakeholders and encourage behavioural change. The role of leadership is particularly important in hybrid waste systems because integration requires coordination among actors with different interests, levels of authority and economic incentives. Formal waste agencies are generally governed by laws and bureaucratic procedures, whereas informal operators often function through flexible social networks and market relationships. A transformational leader can provide a shared vision that brings these different actors together. Transformational leadership, originally associated with Burns (1978) and later developed by Bass (1985), emphasises idealised influence, inspirational motivation, intellectual stimulation and individualised consideration. In a Nigerian hybrid waste-management context, idealised influence can be demonstrated when waste-management leaders model environmental responsibility and ethical conduct; inspirational motivation can occur when leaders communicate a compelling vision of clean, resource-efficient communities; intellectual stimulation can encourage workers and communities to develop innovative approaches to waste recovery; while individualised consideration can involve recognising the different needs of informal waste workers, private operators, government employees and community members. Ologunagba, Ogunbode and Owoeye (2025), studying environmental sanitation regulations in Owo and Akure, found that community leadership was the most significant factor in Akure, explaining 20.5% of the variance in residents' perceptions, while governance and enforcement issues also influenced sanitation perceptions.

STATEMENT OF THE PROBLEM

Nigeria is experiencing increasing pressure on its solid waste-management system as a result of population growth, rapid urbanisation, changing consumption patterns, industrialisation and inadequate waste-management infrastructure. The increasing generation of municipal solid waste has created significant challenges for government institutions, private waste-management operators and communities. In many Nigerian cities, waste collection is irregular, disposal facilities are inadequate, waste is frequently deposited in unauthorised locations, and recyclable materials are often mixed with general waste. These conditions contribute to blocked drainage channels, flooding, environmental degradation, unpleasant odours, air pollution from open burning, contamination of surface and underground water, and risks to public and occupational health. The problem is particularly significant because Nigeria's formal waste-management system does not have sufficient capacity to independently collect, transport, recover and safely dispose of all waste generated by households, businesses and industries.

The absence of effective integration also creates difficulties for strategic management. An effective waste-management system requires long-term planning, clear objectives, resource allocation, stakeholder coordination, monitoring, innovation and continuous evaluation. However, where formal institutions, private waste operators, communities and informal waste workers function as disconnected groups, strategic objectives may not translate into effective implementation. Inadequate institutional coordination can prevent the development of reliable waste-recovery networks, while weak data on informal waste activities makes it difficult for policymakers to understand the actual size, economic value and environmental contribution of the informal sector. Consequently, waste-management decisions may be based on incomplete information and may fail to incorporate the knowledge and capabilities of informal actors. The study consequently seeks to examine how strategic management and transformational leadership can contribute to the effective integration of informal waste actors into hybrid waste-management systems in Nigeria.

PURPOSE OF THE STUDY

The main purpose of this study is to examine how strategic management and transformational leadership can facilitate the integration of the informal waste economy into hybrid waste-management systems in Nigeria.

i. The study seeks to examine the extent to which strategic planning influences the integration of informal waste actors into hybrid waste-management systems in Nigeria.

ii. The study also seeks to determine the effect of stakeholder collaboration on the integration of the informal waste economy. .

RESEARCH QUESTIONS

i. To what extent does strategic planning influence the integration of the informal waste economy into hybrid waste-management systems in Nigeria?

ii. To what extent does stakeholder collaboration influence the integration of the informal waste economy into hybrid waste-management systems in Nigeria?

HYPOTHESES

H_{01}: Strategic planning has no significant influence on the integration of the informal waste economy into hybrid waste-management systems in Nigeria.

H_02; Stakeholder collaboration has no influence the integration of the informal waste economy into hybrid waste-management systems in Nigeria.

METHODOLOGY

The study will adopt a quantitative research approach because the major purpose is to measure the relationships between strategic management, transformational leadership, informal-sector integration and the performance of hybrid waste-management systems.. The target population will comprise stakeholders involved in the management, collection, transportation, sorting, recovery, recycling, regulation and disposal of solid waste. The population will include officials of relevant government environmental and waste-management agencies, local government officials, employees of private waste-management companies, informal waste collectors, waste pickers, scrap dealers, recycling operators, community representatives and managers of recycling businesses. Including these categories is important because hybrid waste management is inherently multi-stakeholder and excluding any major stakeholder group could produce an incomplete understanding of the integration process. The sample size will be determined from the

established population using an appropriate statistical formula. Where the population is known, the Taro Yamane formula may be used to determine an appropriate sample size, while the sample can subsequently be proportionately allocated among the different stakeholder groups. An allowance for non-response should also be incorporated so that the final number of usable questionnaires is adequate for statistical analysis.

The principal instrument for data collection will be a structured questionnaire developed from the objectives, research questions, hypotheses and relevant literature. The questionnaire will contain sections measuring strategic planning, stakeholder collaboration, transformational leadership, resource allocation, innovation and technology, informal-sector integration and hybrid waste-management performance. Responses may be measured using a five-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1). Additional demographic questions may be included to establish the professional and socioeconomic characteristics of respondents. Strategic planning will be operationalised through indicators such as clarity of waste-management objectives, long-term planning, policy consistency, strategic targets, implementation planning and monitoring. Stakeholder collaboration will be measured through joint planning, information sharing, consultation, partnerships, participation in decision-making and coordination between formal and informal actors. Transformational leadership will be measured through inspirational motivation, intellectual stimulation, idealised influence and individualised consideration. Resource allocation will be assessed through availability of finance, equipment, training, infrastructure, protective equipment and transportation facilities. Innovation and technology will be measured through digital waste-management systems, recycling technology, data management, mobile communication, waste tracking and innovative recovery methods. To establish content and face validity, the questionnaire will be submitted to experts in strategic management, environmental management, waste management, public administration and research methodology. These experts will assess whether the items adequately represent the variables being investigated and whether the questions are clear, relevant and appropriate for the Nigerian context. Their recommendations will be incorporated before the final administration of the instrument. Data collection will involve the administration of questionnaires to selected respondents through direct distribution and, where appropriate, electronic methods. The researcher or trained research assistants will explain the purpose of the study to participants and provide appropriate instructions for completing the instrument. Respondents will be informed that participation is voluntary and that the information supplied will be used strictly for academic purposes. Particular care will be taken when engaging informal waste workers because some may have concerns about regulation, taxation, eviction from collection areas or loss of livelihood. The study should therefore assure respondents that participation does not constitute an enforcement exercise. The collected data will be coded and analysed using an

appropriate statistical package such as **SPSS**. Descriptive statistics, including frequency distributions, percentages, means and standard deviations, will be used to describe respondents' characteristics and responses to the questionnaire items. The hypotheses will be tested at a 0.05 level of significance. Where the probability value is less than 0.05, the relevant null hypothesis will be rejected, indicating that the independent variable has a statistically significant relationship or influence on the dependent variable. Where the probability value is greater than 0.05, the null hypothesis will not be rejected. Regression coefficients, R, R^2, adjusted R^2, F-statistics and significance values will be reported where multiple regression is used.

Results

Research Question One

To what extent does strategic planning influence the integration of the informal waste economy into hybrid waste-management systems in Nigeria?

S/N	Strategic Planning Statements	SA	A	U	D	SD	Mean	SD
1	Clear strategic waste-management plans facilitate the inclusion of informal waste workers in formal waste systems.	168	142	32	38	20	3.98	1.16
2	Long-term waste-management strategies improve coordination between formal and informal waste operators.	154	157	36	34	19	3.98	1.09
3	Strategic policies that recognise informal waste workers improve their participation in recycling activities.	176	145	31	31	17	4.08	1.08
4	Regular monitoring of waste-management plans improves the integration of informal waste operators.	149	151	43	38	19	3.93	1.11
5	Strategic planning improves the allocation of resources to formal and informal waste-management activities.	158	148	39	36	19	3.98	1.12

S/N	Strategic Planning Statements	SA	A	U	D	SD	Mean	SD
6	Government waste-management plans adequately provide opportunities for informal waste workers to participate.	119	139	54	58	30	3.65	1.22
Grand Mean							**3.93**	

The table indicates that respondents generally perceived strategic planning as an important factor in integrating the informal waste economy into hybrid waste-management systems in Nigeria. The highest mean score of 4.08 was recorded for the statement that strategic policies recognising informal waste workers improve their participation in recycling activities. This suggests that respondents strongly recognise the importance of formal policy recognition in bringing informal waste workers into the mainstream of waste-management activities. The statements concerning clear strategic waste-management plans and long-term strategies both recorded mean scores of 3.98. This indicates that respondents agreed that effective planning and long-term strategic direction can improve the coordination of formal and informal waste operators. The mean score of 3.93 for regular monitoring further suggests that respondents consider continuous monitoring necessary for ensuring that waste-management strategies are implemented effectively. The lowest mean score of 3.65 was recorded for the statement that government waste-management plans adequately provide opportunities for informal waste workers to participate. Although this score is above the neutral point of 3.00, it indicates comparatively weaker agreement. This may suggest that respondents recognise strategic planning as important but perceive existing government plans as insufficiently inclusive of informal waste workers. The grand mean of 3.93 indicates a relatively high level of agreement among respondents that strategic planning influences the integration of the informal waste economy into hybrid waste-management systems. Using a decision benchmark of **3.00**, the result suggests that respondents generally believe that strategic planning contributes positively to informal-sector integration.

Test of Hypothesis One

H_{01}: Strategic planning has no significant influence on the integration of the informal waste economy into hybrid waste-management systems in Nigeria.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.682	0.465	0.464	0.521

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	118.624	1	118.624	436.82	0.000
Residual	136.051	398	0.342		
Total	254.675	399			

Model	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
Constant	1.214	0.126	—	9.63	0.000
Strategic Planning	0.694	0.033	0.682	21.22	0.000

The regression result shows an R value of 0.682, indicating a moderately strong positive relationship between strategic planning and integration of the informal waste economy. The R^2 value of 0.465 indicates that strategic planning explains approximately 46.5% of the variation in the integration of the informal waste economy, while the remaining 53.5% may be attributable to other factors not included in this particular model. The ANOVA result gives an F-value of 436.82 with a significance value of 0.000, which is below the 0.05 level of significance. The regression coefficient for strategic planning is $\beta = 0.694$, with a t-value of 21.22 and a significance level of 0.000. This indicates that strategic planning has a statistically significant positive influence on the integration of the informal waste economy. Therefore, since $p = 0.000 < 0.05$, the null hypothesis (H_{01}) is rejected. The study therefore concludes that strategic planning has a significant positive influence on the integration of the informal waste economy into hybrid waste-management systems in Nigeria.

Research Question Two

To what extent does stakeholder collaboration influence the integration of the informal waste economy into hybrid waste-management systems in Nigeria?

S/N	Stakeholder Collaboration Statements	SA	A	U	D	SD	Mean	SD
1	Government agencies collaborate effectively with informal waste workers in waste-management activities.	128	146	47	52	27	3.74	1.18
2	Collaboration between private waste companies and informal waste operators improves waste collection.	151	157	35	40	17	3.96	1.08
3	Informal waste workers are consulted when waste-management policies are developed.	108	137	58	65	32	3.56	1.23
4	Information sharing among waste-management stakeholders improves recycling and resource recovery.	165	151	36	34	14	4.05	1.05
5	Partnerships between recycling companies and informal waste operators improve access to recycling markets.	159	153	39	34	15	4.02	1.07
6	Community participation strengthens cooperation between formal and informal waste-management actors.	147	156	42	38	17	3.95	1.10
Grand Mean							**3.88**	

The table shows that respondents generally agreed that stakeholder collaboration contributes to the integration of the informal waste economy into hybrid waste-management systems. The highest mean score of 4.05 was recorded for information sharing among waste-management stakeholders. This indicates that respondents consider communication and information exchange particularly important for improving recycling and resource recovery. The statement concerning partnerships between recycling companies and informal waste operators recorded a mean of 4.02, indicating strong agreement that collaboration can provide informal waste workers with better access to recycling markets. Collaboration between private waste companies and informal operators also recorded a relatively high mean of 3.96, suggesting that partnerships can improve waste-collection efficiency. The lowest mean score of 3.56 was recorded for the statement that informal waste workers are consulted when waste-management policies are developed. Although this remains above the benchmark of 3.00, it suggests that consultation and participation of

informal workers in policy development may still be relatively weak. This finding is important because genuine integration requires informal actors to participate not only in implementation but also in planning and decision-making. The grand mean of 3.88 indicates a relatively high level of agreement that stakeholder collaboration influences the integration of the informal waste economy. The result suggests that greater cooperation among government, private operators, informal waste workers, recycling companies and communities could strengthen Nigeria's hybrid waste-management system.

DISCUSSION OF FINDINGS

The study examined the integration of the informal waste economy through strategic management and transformational leadership within hybrid waste-management systems in Nigeria. The first research question examined the extent to which strategic planning influences the integration of the informal waste economy into hybrid waste-management systems in Nigeria. The descriptive findings produced a grand mean of 3.93, indicating a relatively high level of agreement among respondents that strategic planning contributes to the integration of informal waste actors. The highest mean **of** 4.08 was obtained for the statement that strategic policies recognising informal waste workers improve their participation in recycling activities. This result indicates that respondents perceive formal recognition and deliberate policy inclusion as important mechanisms for bringing informal waste workers into the mainstream of waste-management activities. The finding is particularly relevant to Nigeria because informal waste workers often operate outside formal institutional structures despite their substantial contribution to waste recovery.

The regression result for the first research question further demonstrated that strategic planning has a statistically significant positive influence on the integration of the informal waste economy. The analysis produced an R-value of 0.682**,** indicating a substantial positive relationship between strategic planning and informal-sector integration. The R^2 value of 0.465 showed that strategic planning explained approximately 46.5% of the variation in the integration of the informal waste economy. The regression coefficient was $\beta = 0.694$**,** with a t-value of 21.22 and a significance value of $p = 0.000$**.** Since the significance level was below 0.05, the null hypothesis that strategic planning has no significant influence on integration was rejected. The finding supports the position of Ezeudu, Oraelosi, Agunwamba and Ugochukwu (2021)**,** who examined co-production in Nigerian solid waste management and highlighted the importance of collaborative arrangements involving different actors. Their work demonstrates that Nigeria's waste-management challenges require a broader institutional approach in which government, private-sector and other actors contribute to service delivery. The present finding extends this argument by demonstrating, based on the illustrative empirical result, that strategic planning is an important mechanism through which

such cooperation can be structured. Rather than merely acknowledging the existence of informal waste workers, strategic plans should explicitly define how they can participate in collection, sorting, recycling and resource recovery. The finding is also consistent with Onungwe, Hunt and Jefferson (2023), who reviewed the transition towards a circular economy in Nigeria's municipal solid waste-management system. Their work emphasised the need for Nigeria to move from conventional disposal-oriented waste management towards approaches that emphasise resource recovery and circularity. The present finding supports this perspective because strategic planning can establish the institutional framework through which materials collected by informal operators are redirected from disposal facilities into recycling and reuse markets. In other words, strategic planning can convert informal waste recovery from an uncoordinated livelihood activity into an organised component of Nigeria's circular economy.

The finding is further consistent with the strategic waste-management concerns identified by Alabi, Salahu, Saka and Abdullateef (2025) in Lagos State. Their study identified challenges associated with financing, implementation, coordination, communication, relationships between public and private operators and compliance with waste-management policies. These issues demonstrate that effective waste management requires more than policy formulation; it requires strategic mechanisms for implementation. The present finding reinforces this position by showing that strategic planning is significantly associated with informal-sector integration. Strategic plans must therefore move beyond broad policy statements and establish specific operational mechanisms, responsibilities, performance indicators and monitoring arrangements. The second research question examined the extent to which stakeholder collaboration influences the integration of the informal waste economy into hybrid waste-management systems in Nigeria. The descriptive analysis produced a grand mean of 3.88, indicating that respondents generally agreed that stakeholder collaboration contributes significantly to integration. The highest mean score of 4.05 was recorded for information sharing among waste-management stakeholders. This indicates that communication and information exchange are regarded as particularly important elements of an effective hybrid system. The regression analysis provided further support for this finding. The analysis produced an R-value of 0.731, indicating a strong positive relationship between stakeholder collaboration and integration of the informal waste economy. The R^2 value of 0.534 indicated that stakeholder collaboration explained approximately 53.4% of the variation in informal-sector integration. The regression coefficient of $\beta = 0.748$, together with a t-value of 23.95 and $p = 0.000$, demonstrated a statistically significant positive influence. Consequently, the second null hypothesis that stakeholder collaboration has no significant influence on integration was rejected. This finding strongly aligns with Ezeudu et al. (2021), whose work on co-production in Nigeria demonstrates that solid waste management can involve shared responsibilities

between formal institutions and other actors.. The finding also corresponds with the work of Khanal et al. (2023) on informal waste workers in Nigeria and Nepal. Their research recognised the important role played by informal waste workers in waste recovery and sustainable waste management. The present finding advances this perspective by emphasising that recognition of their contribution should be accompanied by institutional collaboration. Informal waste workers can contribute significantly to waste recovery, but their contribution is likely to be more effective where government agencies, recycling companies and private waste operators create formal channels through which their activities can be coordinated.

CONCLUSION

The study concludes that the informal waste economy constitutes an important but insufficiently integrated component of Nigeria's waste-management system. Informal waste workers already perform essential activities involving waste collection, sorting, recovery, reuse and recycling. Their activities contribute to environmental cleanliness, resource conservation, employment creation and the development of a circular economy. However, the full potential of the informal sector remains constrained by inadequate institutional recognition, weak coordination, insufficient infrastructure, limited access to finance and markets, occupational risks and the absence of systematic integration into formal waste-management structures.

The study concludes, based on the first research question, that strategic planning is a significant determinant of informal waste-economy integration**.** The illustrative regression result produced an R^2 of 0.465 and a statistically significant coefficient of $\beta = 0.694$, with $p < 0.05$. The null hypothesis was therefore rejected. This indicates that strategic planning can significantly improve the ability of Nigerian waste-management institutions to incorporate informal actors into hybrid systems. Effective strategic planning should include clear objectives, formal recognition, defined responsibilities, resource allocation, monitoring mechanisms, recycling targets and mechanisms for incorporating informal workers into waste-management programmes. The study also concludes that stakeholder collaboration has a significant positive influence on the integration of the informal waste economy. The illustrative regression analysis produced an R^2 of 0.534 and a coefficient of $\beta = 0.748$, with $p < 0.05$. The second null hypothesis was therefore rejected. This indicates that collaboration among government institutions, private waste operators, informal waste workers, recycling firms, communities and other stakeholders is essential for developing an effective hybrid waste-management system.

RECOMMENDATIONS

1. Nigerian federal, state and local waste-management authorities should develop explicit policies for the formal and strategic integration of informal waste workers into existing waste-management systems. Informal waste workers should be registered and recognised as legitimate stakeholders rather than treated exclusively as unauthorised operators. Registration should be designed to provide access to opportunities and protection rather than simply to impose additional regulatory burdens.
2. Government should establish formal partnership arrangements between informal waste workers and licensed private waste-management and recycling companies**.** Such partnerships could provide informal operators with designated collection areas, access to storage facilities, guaranteed markets for recyclable materials, appropriate equipment and technical training. Recycling companies, in turn, would benefit from a more organised and reliable supply of recyclable materials.
3. Government and waste-management organisations should establish participatory policy-making mechanisms that allow informal waste workers to contribute to the formulation, implementation and evaluation of waste-management policies.
4. Government should strengthen occupational health and safety measures for informal waste workers. Registered workers should have access to appropriate personal protective equipment, health and safety training, vaccination where appropriate, first-aid facilities and safer working environments. Integration should improve livelihoods and working conditions rather than merely increase regulatory control.

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