

Sustainable Paradigms for Waste Ceramics: Ecological Responsibility and National Moral Image

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Abstract: Amid the global context of ecological governance and intensifying competition over national image, ecological responsibility has emerged as a core dimension in shaping a nation's moral identity. Ceramics embody the dual attributes of "nature and culture"—they serve not only as symbolic emblems of Chinese civilization but also as representative subjects for examining the ecological transformation of industries, given their resource dependency and the challenges posed by ceramic waste. This paper investigates the sustainable paradigm of waste ceramics to explore how ecological responsibility and national moral image are constructed. Through sustainable design, waste ceramics are transformed from "ecological and cultural liabilities" into "new resources bearing multiple values." This transformation is realized through three interrelated practical pathways: the transparent representation of material narratives, the embedding of metaphorical forms into everyday life, and the construction of communal systems through service design. These approaches translate abstract principles of ecological responsibility and intergenerational equity into tangible, perceptible material forms, thereby illuminating the ecological foundation of Chinese modernization and the ethical commitment of a major country.

Keywords: Sustainable Design; Waste Ceramics; National Image; Ecological Responsibility

1. Introduction

General Secretary Xi Jinping pointed out in the report to the 20th National Congress of the Communist Party of China that "Harmony between humanity and nature is a distinctive feature of Chinese modernization. China is a committed advocate and key contributor to global green development." [1] As a participant,

contributor, and leader in global ecological governance, China is unwaveringly pursuing a path of ecological priority and green development. It embodies the responsibility of a major country on ecological and environmental issues and has proposed the initiative of building a community with a shared future for mankind.

A national image is the overall impression and cognition of a sovereign state by domestic and international societies, serving as an important resource for sovereign states to participate in international affairs. [2] Against the macro backdrop of the global ecological crisis and civilizational transformation, ecological responsibility has become a new yardstick for measuring a country's level of modernization and its sense of global citizenship. This paper studies the sustainable paradigm of waste ceramics, analyzing the shaping of a nation's moral image from the product to the industrial level, and further explores the pathways to constructing a national image driven by green and sustainable development.

2. Overseas Communication of Ceramic Products and Culture

The Report to the 20th National Congress of the Communist Party of China proposed to "accelerate the development of China's discourse and narrative systems, and present a credible, lovable, and respectable image of China." As a global daily material and cultural symbol, ceramic products embody cultural images in a tangible and embodied manner, rendering them "the best guide to understanding the power of visual representations in the religious and political life of past cultures." [3] Among them, state banquet porcelain and national gift porcelain are the concentrated embodiment of this mission. They transform profound history into perceptible and interactive experiences, transcend the transience of diplomatic activities, and become a witness to eternal friendship. Their sustainable transformation is also easily understood and resonates across different

cultural contexts.

On this basis, the state articulates its moral stance to both domestic and international audiences through material language by supporting and promoting specific sustainable design paradigms—such as advocating ceramic design featuring material honesty, functional sustainability, and systemic circulation: we uphold a cyclical rather than linear development philosophy and are committed, through a cultural attitude of innovative inheritance, to the future vision of a community with a shared future for mankind. Implementing the concept of sustainable design throughout the entire life cycle of the ceramic industry not only demonstrates a country's ability to creatively transform ancient wisdom to address contemporary challenges but also establishes it as an exemplar for assessing the ecological transformation of industries.

3. The Mechanism of Constructing Ecological Responsibility and a Nation's Moral Image

3.1 Ethical Cornerstone: The Paradigm Evolution from Sovereign Justice to Ecological Responsibility

As a core element in shaping a nation's moral image, ecological responsibility emerges from the context of the global ecological and energy crisis. In the past, international evaluative ethics were primarily based on interpersonal and interstate relations — such as sovereignty, strength, peace, and justice — with the implicit premises of anthropocentrism and sovereign boundaries. Although transnational environmental problems (e.g., air and river pollution) had emerged, they were largely discussed within frameworks of sovereign disputes or technical cooperation rather than as independent moral issues. The intensification of the global ecological and energy crisis, coupled with leaps in scientific understanding, has driven an ethical revolution. In addressing the relationship between humanity and nature, the ecological vision of Chinese modernization advocates treating humanity and nature as a community of life, proposing that "humanity and nature are a community of life." [4] From anthropocentrism to a community of life on Earth, intergenerational justice has become a core ethical principle. Whether a country's policies deplete the ecological resources of

future generations has become a touchstone for its moral legitimacy. Sustainable design seeks to meet the needs of the present without compromising the ability of future generations to meet their own needs. [5] Ecological ethics reshape the foundation for evaluating a nation's moral image, extending moral concern to the holistic relationships between "humanity and nature" and "the present and the future." It compels nations to confront a fundamental question: what obligations do we owe to the Earth and to future generations?

In the contemporary era, a country's image of modernization and progress is no longer defined merely by GDP growth or achievements in science, technology, and military affairs, but increasingly by the green content of its development and its mode of coexisting with nature. The capacity for "ecological modernization" has become a new defining criterion. Clean air, a stable climate, and rich biodiversity are quintessential global public goods. Actively providing and safeguarding such goods is the most intuitive way for a country to demonstrate its sense of "global citizenship." A country's environmental behavior has cross-border and even global implications. Consequently, ecological responsibility possesses an inherent "international public nature," and a country's ecological performance directly indicates whether it is a "responsible member of the community" or a "moral free-rider." [6]

3.2 Material Carrier: The Dual "Nature-Culture" Dual Attributes of Ceramics

Admittedly, although the ceramic industry is not the largest emitter of carbon emissions, its characteristics—particularly in terms of resource dependence (e.g., kaolin), high energy consumption (high-temperature firing), and waste disposal — provide a concrete observational lens for systematically demonstrating a country's commitment to ecological responsibility, industrial upgrading, and value leadership. [7]

Natural attributes: The core raw materials for ceramic production are natural minerals such as clay, feldspar, and quartz. Their extraction and screening processes are inherently dependent on the natural conditions of specific regions. For instance, kaolin in Jingdezhen and porcelain clay

in Dehua are deeply intertwined with their local geological environments. This attribute of "deriving from nature" determines that the ceramic industry maintains a close connection with the ecosystem from its very source. In traditional production, ceramic firing is highly reliant on the natural environment. Ancient kiln sites in Jingdezhen, for example, were predominantly situated along the Changjiang River, utilizing the water system for raw material transportation and kiln cooling, while leveraging the local mild climate to ensure the stability of porcelain body drying. The firing of dragon kilns and wood-fired kilns even employed natural fuels such as timber as an energy source. All these factors underscore the ceramic industry's dependence on natural conditions, illustrating ceramics as a quintessential example of the co-production between humanity and nature.

Cultural attributes: Ceramics constitute one of the core cultural symbols of Chinese civilization. From primitive celadon and Tang tri-color glazed pottery to the minimalist aesthetics of Song Dynasty porcelain; from the elegant grandeur of Yuan Dynasty blue-and-white to the exquisite intricacy of Ming and Qing official kiln wares — the forms, patterns, and craftsmanship of ceramic products reflect the cultural aesthetics and social landscapes of different eras, serving as a vital medium through

which the international community apprehends Chinese culture (Figure 1). In the context of globalization, the cultural attributes of ceramic products elevate them beyond the general industrial category, rendering them a symbolic token of a country's cultural identity. Labels such as "Made in Jingdezhen," "English Bone China," and "Japanese Mino-yaki" are not merely geographical indicators but also signifiers representing product quality, stylistic identity, and even national image.[8] As the quoted source notes, "It shows a country's culture-based differentiation and relevance to its target audience, typically manifested in the public's symbolic association with a country." In the contemporary era, the cultural attributes of the ceramic industry have expanded from the inheritance of traditional craftsmanship to encompass cultural and creative innovation. The regenerative design of diverse waste materials by the Guangzhou-based design brand "BenTu Creation" exemplifies this trend (Figure 2). By integrating waste materials into furniture design and public art installations, this approach not only achieves the recycling of ecological resources but also imbues waste materials with renewed cultural significance. The synergy between the practice of ecological responsibility and cultural innovation thus becomes a dual embodiment of a country's cultural vitality and ecological governance capacity.

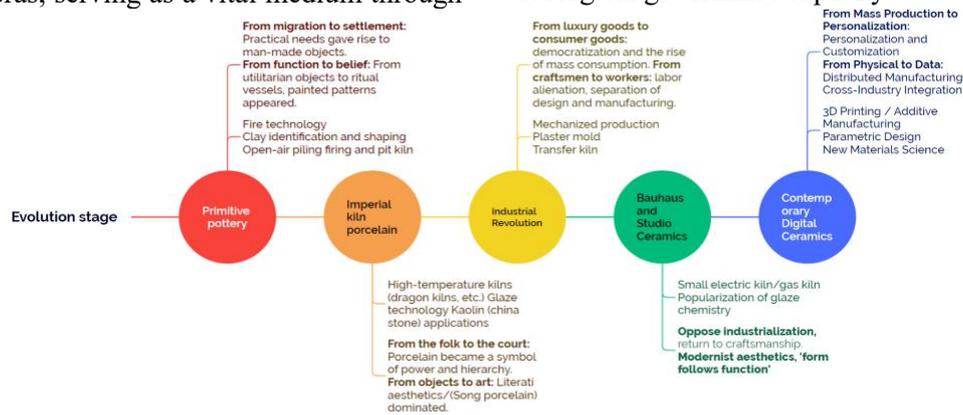


Figure 1. The Development Process of Ceramics.



Figure 2. BENTU Creation

3.3 Problem Orientation: Sustainable Design of Waste Ceramics

Waste ceramics refer to defective products, shards, and waste materials generated during the production, consumption, and demolition of ceramic products, including both glazed and unglazed ceramic body waste. Characterized by non-degradability and high hardness, they primarily originate from industrial residues, domestic waste, and construction debris, embodying both the risk of environmental pollution and the potential for resource regeneration.[9] As inorganic non-metallic materials, ceramics possess numerous advantages such as high hardness, acid and alkali resistance, high-temperature tolerance, dimensional stability, and low water absorption. However, these very properties also render them resistant to decomposition in the natural environment, with their physical characteristics remaining unchanged even after breakage. From an ecological perspective, the stable physical properties of waste ceramics imply that their long-term accumulation not only occupies substantial land resources but may also lead to soil and water contamination due to the leaching of heavy metal components from raw materials, thereby constituting an ecological liability in the development of the ceramic industry. Culturally, waste ceramics themselves embody porcelain-making craftsmanship and cultural aesthetics; their arbitrary disposal after damage represents a squandering of precious cultural carriers, thus forming a "cultural negative asset." Through processes such as crushing and screening, waste ceramics can be converted into recycled aggregate for the production of building materials such as concrete and permeable bricks. Alternatively, they can replace a portion of virgin raw materials in ceramic production, thereby reducing the exploitation of natural resources and realizing an ecological closed loop of "resource - product - waste - recycled resource" (Table 1). Certain waste ceramic shards and blanks can also be transformed into artistically reconstructed artifacts, public art installations, or surface decorations for architectural art through artistic reconfiguration and creative design, thereby perpetuating their cultural genes and achieving the secondary activation of cultural value.

The value transformation of waste ceramics is not a mere 'waste recycling' effort but a

systematic process of value reconstruction centered on sustainable design. By overcoming technical bottlenecks in resource utilization through technological innovation and imbuing waste ceramics with new value connotations through cultural innovation, this process ultimately enables a fundamental transition from a negative heritage of "ecological burden + cultural waste" to a new resource characterized by "ecological friendliness + cultural empowerment + economic appreciation." [10] This transformation is not only a direct manifestation of the ecological responsibility of the ceramic industry but also a concrete expression of a country's ecological governance capacity and cultural inheritance and innovation capability, thereby providing significant support for shaping a nation's moral image.

3.4 Core of Translation: Design as a Strategic Medium for Ethical Narrative

Traditional design discourse often interprets artifacts within the instrumental rationality framework of "form follows function" or within purely aesthetic categories, with its core mission defined as solving specific problems, creating market value, or achieving aesthetic expression. However, when design practice is examined under the macro national strategic issue of "ecological responsibility and a nation's moral image"- particularly in the specific field of sustainable design for waste ceramics - its role undergoes a fundamental leap: design is no longer merely a supporting tool for industrial development but is elevated to a strategic medium through which the state conducts sustainable moral narratives, constructs social identity, and participates in global value competition. The essence of this transformation lies in design's key function of systematically translating the country's abstract, non-material ethical commitments into perceptible, circulable, and interactive material forms.

National-level concepts such as ecological responsibility, cultural commitment, and intergenerational equity are, by their nature, non-material and conceptual ethical constructs. Should they remain confined to policy documents or diplomatic rhetoric, it would be difficult to cultivate lasting, profound, and resonant social cognition or international image. Design - particularly product and system design - is uniquely equipped to accomplish this creative translation from "concept" to "experience." Its

translational logic is not a matter of simple symbolic addition or formal packaging, but rather the embedding of responsibility and ethics into the entire life cycle of products through a

series of deliberate materialization operations— from material selection, form shaping, and function setting to service models and recycling.[11]

Table 1. Case of Recycling and Reusing Discarded Ceramics (Image Source: Internet).

Treatment method	Classification	Picture	Process Applications
Process Applications	Repair		Kintsugi / Drill Porcelain: Repairing damaged ceramic artifacts with lacquer, gold powder, or metal staples, transforming imperfection into beauty, turning them into artworks for continued use.
			Repair: Use modern materials such as epoxy resin for restoration.
	Use as a whole or in part directly		Art creation
			Construction Fill Material: On construction sites, large pieces of waste bricks and sanitary ware can be directly used as fill material for foundations and roadbeds.
Resource Recycling and Reuse	Building materials aspect		Recycled Aggregate: Crushing and sieving waste porcelain into particles of different sizes. Used in concrete as a substitute for natural sand and gravel; used in mortar; used in brick production to manufacture sidewalk bricks, square bricks, permeable bricks, etc.
	Agriculture and forestry aspects		Ceramsite: Grinding ceramic waste into powder, granulating, and then sintering at high temperature to produce lightweight ceramsite. Used in soilless cultivation, landscaping, wastewater treatment, etc.
	Construction Aspect		Mosaic Art: Using the colors and textures of ceramic fragments to create collages such as murals, decorative paintings, furniture surfaces, etc.
Energy Application	3D printing ceramic waste		3D Printed Ceramic Lamps: Grinding old and discarded ceramic fragments into powder and mixing with raw clay.

Taking the sustainable design of waste ceramics as an example, the core ethics it translates are: confronting the environmental burdens inherent in development and transforming them into new resources and values through innovative means. A tea set, tableware, or public seat made from recycled waste ceramics transforms grand concepts such as "life cycle assessment" and "circular economy" into direct sensory experiences through the user's touch (granular texture, spliced grain), vision (mixed colors, ceramic shard lines), and even hearing (the unique sound when tapped). This "embodied cognition" is more intuitive and profound than policy white papers or promotional videos. In the embodied practice of holding, using, and appreciating regenerated artifacts made from waste ceramics, users unconsciously perceive the ecological values carried by the artifacts, achieve an embodied identification with the country's ecological and moral propositions, and realize an immersive narrative effect of "embodying ideas through objects."

4. From Artifacts to Systems: Practical Paths of Sustainable Design

4.1 Material Narrative: Making Circular Value Visible and Tangible

Through the principle of embodying ideas in objects, and via systematic design practice, the country's abstract ethical commitments regarding ecological responsibility, cultural inheritance, and value consensus are translated into perceptible, circulable, and participatory material forms and social actions. The narrative mechanism is not a matter of simple symbolic addition, but rather a perceptual framework for the country's sustainable moral image, constructed jointly at the micro-artifact level and the macro-system level through three interrelated practical pathways: the explicit perception of material substances, the moral metaphor of form and function, and the narrative extension of systematic services.

Materials are the foundation of artifact narrative. The sustainable design of waste ceramics encodes ecological responsibility into material language through "honest material expression." For example, in the design of Xun Re.dust, a recycled ceramic brand in Jingdezhen, an unglazed treatment is deliberately chosen to fully reveal the purity and complexity of the product's body texture. The surface is densely

covered with distinguishable red, green, brown, and other colored particles—formed by crushing waste porcelain with different glazes—which are not defects but authentic markers of the material's recycled identity. Rather than concealing the heterogeneous history of raw materials beneath a uniform glaze layer, this design choice directly transforms the cyclical process of "breaking - reconstructing" into a unique visual language and tactile experience. In an almost declarative material presentation, it elevates the "colorful ruins" of linear consumption into a "symbiotic new entity" carrying diverse memories within the circular economy.

On the other hand, promoting the material evidence presentation of the supply chain — clearly marking the source and processing technology of waste ceramics through design labels, QR code traceability, and other means — makes the country's industrial ecological policies and green transformation practices visible and verifiable, transforming abstract ecological responsibility into a material basis trusted by consumers. The core of this pathway is to establish a trust narrative based on transparency, openness, and authenticity. At the same time, we must guard against the risk of narrative greenwashing — where material storytelling becomes disconnected from the genuine assessment of the whole life cycle — lest the moral carrier be reduced to a mere ethical performance, seriously damaging the credibility foundation of the brand and even the national image.

4.2 Morphological Metaphor: Embedding Value Concepts into Daily Life

The form and function of artifacts are the direct carriers of moral narrative. Through elaborate design of morphological language, sustainable values are metaphorized and embedded in products, while taking into account the natural and cultural attributes of ceramics themselves. Design thinking can be carried out from three aspects: (1) Advocating the aesthetics of repair, where the form of artifacts conveys the concept of "resilient design", such as designing detachable and replaceable ceramic components. Product parts (teapots, tableware, etc.) can be replaced individually instead of discarding the whole due to a single damage. Products are designed as modular systems that are easy to

repair, upgrade and restructure to adapt to changing needs and environments, thus metaphorizing the value of "resilient development" in national governance; (2) Expressing the principle of moderation, such as ceramic individual dining utensils with just the right capacity, criticizing over-consumption and food waste with a moderate form, and echoing the country's policy mechanism of "saving food and opposing waste"; (3) Reserving open space for participation, such as modular ceramic ornaments that invite users to combine and complete the final form by themselves, strengthening the public's cognition as a community of responsibility. General Secretary Xi Jinping pointed out that "everyone is a disseminator and practitioner of ecological civilization construction".[12] This "unfinished" design symbolizes that sustainability is a cause for the whole people to participate in and an ongoing endeavor, a humble and positive philosophy of action always facing the future.

4.3 Narrative Extension: Community Construction in Service and System Design

In his book *Design for the Real World*, Victor Papanek wrote that "whether designers like it or not, they must firmly plant one foot in the future." [13] Design is a future-oriented practice, bearing the profound mission of guiding social development and cultural evolution. This future orientation is particularly profound at the national level, going far beyond creating an isolated "green object" to constructing a design ecosystem that can evolve continuously, optimize iteratively and promote systemic change. Design thinking needs to shift from the obsession with the "object" itself to the shaping of the relationships, processes and meanings in which the "object" is embedded. The higher-level narrative of sustainable design for waste ceramics lies in transcending individual artifacts and constructing a complete ethical and moral closed loop running through "artifacts - services - practices" by extending the narrative boundary.

At the product-service system level, sustainable narrative is reflected in the fundamental innovation of business models. For example, implementing a subscription service for ceramic utensils, transforming users from "purchasing ownership" to "paying for the right to use". Old utensils are recycled, redesigned and renovated for re-circulation. This not only extends the

material life cycle, but also transforms linear consumption behavior into a long-term, recyclable service system. This model itself is a case of the country promoting the circular economy transformation "from ownership to usufruct". At the participatory design level, the narrative further goes deep into the joint construction of social members. Relying on community groups supported by the state or local governments, citizens are organized to jointly create public art installations using local waste ceramic shards. In this process, design is elevated to a public activity that consolidates community identity and practices citizens' ecological responsibility. The final output is not only an artifact or a work of art, but also a material proof of the collective responsibility and achievements of "we jointly repair the environment and shape our homeland". Demonstrating the country's moral image as an ecological mobilizer and value resonance through public relations activities, transforming top-down policy advocacy into bottom-up cultural consciousness and collective action.

Through this complete narrative extension from system to service, Papanek's thinking of "being in the future" is transformed into operable and co-creatable present practices, making the country's moral image based on a sustained and firm ethics of responsibility.

5. Conclusion: Towards a Sustainable Future and National Image

Sustainable design is by no means a static, definable, and finalizable goal, but an inherently "unfinished" dynamic cause. Its "unfinished" attribute stems from the challenges it aims to address: a complex ecosystem that is in constant flux, and humanity's endless ethical exploration of its relationship with nature. This also indicates that a country's ecological commitment is not a one-time declaration but a long-term governance practice requiring continuous iteration and deepening. It is a cognitive experiment and value co-construction guided by the state and participated in by the whole society. From "energy conservation and emission reduction" to "circular economy" and then to "just transition," the public's understanding of sustainability is constantly advancing through a process of continuous expansion and deepening. Every promoted sustainable design case—whether a recycled ceramic product or a product-service system - represents a "value

proposition" and "prototype of future life" put forward by the state to the market and society, inviting users to reflect, provide feedback, and engage in subsequent iterations. A country's moral authority is continuously consolidated through this ongoing interaction and the gradual forging of consensus.

Sustainable design is a civilizational dialogue and image construction led by the state and constantly evolving. By materializing policy goals into specific products, systems, and community practices, the state presents its moral stance to the international community - its commitment to ecological restoration, its innovation in cultural heritage, and its dedication to intergenerational equity.

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