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REVIEW ARTICLE

Preservation and Development of Plant Based Dyeing in Dong Ethnic Costumes

Ting Hu[1], Junior Kim Wah[2*]

[1]College of Art and Design, Nanning University, Nanning 530200, Guangxi, China;
Academy Of Arts and Creative Technology, Universiti Malaysia Sabah, Kota Kinabalu 88400, Sabah, Malaysia
Email: hutingmxd1028@sina.com
[2]Academy Of Arts and Creative Technology, Universiti Malaysia Sabah, Kota Kinabalu 88400, Sabah, Malaysia
Email: juniorkimwah@ums.edu.my

CORRESPONDING AUTHOR (*):
Junior Kim Wah
(juniorkimwah@ums.edu.my)

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ABSTRACT

Dong plant-dyeing techniques for traditional dress constitute a key component of the textile and dyeing heritage of China's ethnic minorities, embedding ecological knowledge and cultural value. However, industrialization, and social change have reduced raw-material availability, accelerated the inheritor loss, and weakened public recognition. This study examines the evolution, technical features, and cultural meanings of Dong cloth craftsmanship and identifies current constraints on transmission and sustainable development. Drawing on literature analysis and multi-sited fieldwork, interviews, participant observation, and process documentation were conducted in Guizhou and Guangxi. Comparative analysis focused on production procedures, transmission practices, and contemporary application contexts. The results indicate that Dong plant dyeing is not a single dyeing action but a sequence of tightly linked steps—vat preparation and management, repeated immersion and oxidation, localized shade adjustment and re-dyeing, drying, beating, and sizing—together forming an integrated dyeing–finishing system. This system co-produces color depth, luster, stiffness, and durability, and carries irreplaceable artisanal and identity-related meanings. Nevertheless, the transmission system remains fragile due to limited educational support, insufficiently articulated technical knowledge, and weak market mechanisms. Accordingly, coordinated measures are proposed: protecting dye plants and related ecological resources; strengthening community-based education and learning networks; developing a "parameter–performance" evidence chain with gentle standardization for teaching and quality assessment; building community-led culture–tourism collaboration; and enhancing policy support and international exchange.

Contribution: The paper's primary contribution is showing Dong cloth plant dyeing forms an integrated dyeing–finishing system—vat management, immersion–oxidation, drying, shade adjustment, beating, and sizing—and proposing a safeguarding pathway linking technical practice with social and ecological conditions.

1. Introduction

As global commitments to sustainable development continue to deepen, natural dyes and hand-crafted dyeing and weaving techniques have re-entered the agendas of scholarship and design practice. Plant dyeing uses pigments derived from natural plants and is characterized by renewability and relatively low pollution, while also carrying rich cultural memory and ethnic knowledge systems. Within the clothing traditions of China's ethnic minorities, Dong dress is known for its deep and restrained color palette, delicate patterns, and distinctive dyeing and finishing practices. In particular, the indigo dyeing of Dong cloth, together with finishing treatments—such as sizing and repeated beating to shape the fabric, fix color, soften the hand, and enhance luster—forms a core technical chain. For generations, Dong women have collected, fermented, and applied indigo and other dye plants, transforming local natural resources into garment colors with aesthetic and symbolic meanings, and making dress an important medium that links nature, society, and belief. Ethnobotanical research likewise shows that Dong communities' use of dye plants reflects distinctive local knowledge and is closely embedded in everyday practice (Liu et al., 2014).

However, under the impact of modern synthetic dyes and the fast-fashion system, traditional plant dyeing has gradually been marginalized due to long production cycles, high labor intensity, high costs, and limited market adaptability. The resulting decline in raw material resources, loss of inheritors, weakening of community learning networks, and insufficient public awareness has placed Dong plant-dyeing practices at risk of disappearance. Against the intersecting concerns of intangible cultural heritage safeguarding and sustainable design, there is an urgent need for systematic research on Dong dress plant-dyeing techniques and for practicable pathways for safeguarding and development.

2. Literature Review

Plant dyeing in Dong dress represents an important trajectory through which China's traditional dyeing knowledge has continued to develop and localize in Southwest China. Practices such as repeated immersion and oxidation, dyeing with locally available materials, and post-dye finishing—such as sizing and repeated beating to shape the fabric, fix color, soften the hand, and enhance luster—together constitute an integrated dyeing–finishing system. This system not only determines visual outcomes but also affects durability and functional performance. At a macro level, studies of Chinese dyeing history often treat plant dyeing as an early yet enduring foundation of clothing color systems (Xu, 2021). However, such accounts have difficulty explaining how specific ethnic groups rely on local materials, environmental constraints, and household labor organization to stabilize and sustain a complete process chain over time.

Within research on the Dong, plant dyeing is most often discussed through Dong cloth and the production system that yields its distinctive glossy (bright cloth) finish. Process documentation indicates that handwoven fabric is repeatedly immersed in indigo and

then air-dried to promote oxidation, forming a deep blue ground. The shade is subsequently adjusted using locally available plant materials, and the cloth is over-dyed with indigo again to develop more complex composite hues. The final glossy surface and durability are closely tied to post-dye finishing steps such as sizing and prolonged beating, which compact the yarns and fabric structure to enhance luster and wear resistance (Lin, 2024).Related work also notes that the stiff finishing of Dong cloth is achieved through sizing—applying and padding various animal and plant glues—and through starching—applying and padding different types of starch (Tian, 2015). Yet much of this literature remains primarily descriptive. Key questions remain about how critical parameters determine performance, and how knowledge can be made expressible and teachable without compromising the integrity of the full process.

Studies Existing research on Dong cloth highlights that its dyeing and finishing system is closely tied to everyday wearability: traditional practice emphasizes indigo-dyed dark tones and employs finishing steps to improve handle and durability for regular use (Hua, 2011). Building on such craft knowledge, recent applied studies further shift attention from documentation to contemporary translation, proposing how Dong indigo dyeing can be reworked into modern fashion contexts through process refinement and derivative product development in specific village-based practice (Li, 2021). In parallel, instrument-supported investigations provide material evidence that different finishing processes measurably change fabric physical properties, offering a basis for explaining performance differences and for assessing how these techniques might be adapted to other textile production settings (Luo et al., 2025).

From a safeguarding perspective, a cultural-ecology approach can be understood as a place-based, systems-oriented way of thinking: craft practices are not isolated technical procedures, but are embedded in an interconnected whole that links community settlement patterns, resource use, everyday livelihoods, social relations, and the spatial meanings of place. Drawing on a place-based analysis of the evolution of China's ICH governance, Li et al. argue that policy discourses and institutional arrangements not only shape how heritage is categorized and managed, but also reconfigure the spatial organization and symbolic value of heritage-related landscapes; accordingly, effective safeguarding must address both "how the craft is made" and "the place-bound relationships and lifeworlds that sustain the practice" (Li et al., 2025). Safeguarding should therefore go beyond documenting techniques and reproducing procedures, and simultaneously attend to enabling conditions—such as the sustainable availability of raw materials and ecological resources, community-level organization and cooperation, locally grounded learning and transmission networks,and institutional/spatial supports that allow practitioners to continue producing and exchanging knowledge within their everyday environments. At the same time, this research notes that while certain forms of institutionalization may strengthen administrative coordination and international alignment, they can also weaken local cultural attachment and disrupt vernacular meanings at the community level; conversely, place-centered revitalization tends to strengthen community resilience and promote fairness in cultural-landscape development (Li et al., 2025). This suggests that cultural-ecology safeguarding is ultimately not only about "preserving" craft, but about sustaining the local conditions and socio-environmental linkages through which craft can continue to be practiced.

Overall, the existing literature shows three prominent gaps:(1) limited integration between technical studies and community governance concerns; and (2) a lack of approaches that balance process integrity, policy compliance, and market feasibility.

3. Method

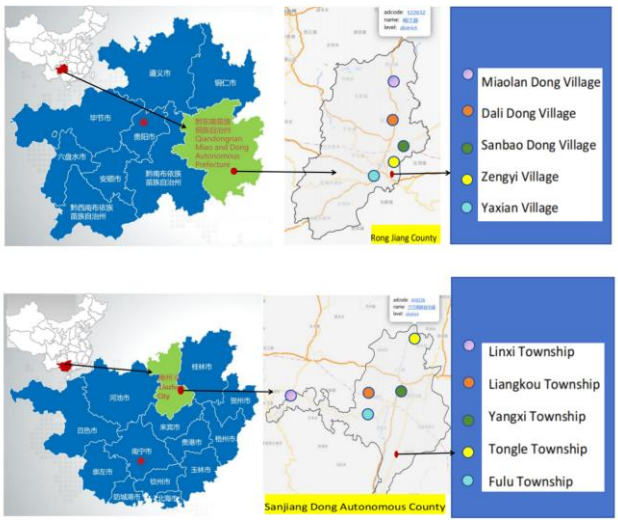
3.1. Research Design

This study employs a research design that combines multi-sited ethnography with literature analysis. Taking Dong cloth plant dyeing as the central case, it examines the overall system of "process chain–transmission mechanism–contemporary translation/application." The research is primarily qualitative, supplemented by visual materials and textual evidence for triangulation, thereby enhancing the credibility of the findings.

3.2. Field Sites

Following a qualitative multi-sited case study approach, this research focuses on the safeguarding and development of plant-dyeing techniques in Dong dress. As the Dong are mainly distributed across the border region of Hunan, Guizhou, and Guangxi, the study selected a set of comparative field sites in two core areas. In Rongjiang County, Guizhou Province, fieldwork was conducted in Mialan Dong Village, Dali Dong Village, Sanbao Dong Village, Zengyi Village, and Yaxian Village. In Sanjiang Dong Autonomous County, Guangxi, field sites included Linxi Township, Liangkou Township, Yangxi Township, Tongle Township, and the Fulu area, enabling cross-site comparison(Figure 1).

Figure 1: Field sites in Rongjiang County (Guizhou) and Sanjiang



Source: drawn by the author

3.3. Participants and Data Collection

Participant recruitment and data collection followed purposive sampling. Along the "production–transmission–communication/innovation" chain of Dong cloth and plant-dyeing techniques in Dong dress, the study selected representative practitioners and inheritors for key-informant interviews. Participants included: Lei Lai (Rongjiang, Guizhou; born 1970; a graduate of Yunnan Arts University), who has long worked on the safeguarding and innovation of Dong cloth, founded the "Dong Cloth Workshop," and has advanced productive safeguarding initiatives such as the program "Workshops: Bringing Mothers Back Home" (interviewed on September 28, 2022); Xianrong Yang (Sanjiang,

Guangxi; born 1966), a county-/municipal-level representative inheritor of Dong dress-making techniques, familiar with the full process from cotton cultivation, spinning, and weaving to dyeing and garment construction (Figures 2 and 3), and who has long organized training and communication activities through an experience center (interviewed on April 11, 2025), and Dongjuan Shi (Sanjiang, Guangxi; born 1988), a municipal-level inheritor of Dong embroidery, who provided oral accounts on pattern meanings, wedding-related uses, and contemporary innovation (interviewed on March 7, 2025).

Data were collected using a multi-source triangulation strategy, including: semi-structured interviews (audio-recorded throughout with oral informed consent), participant observation (covering workshop and household production, vat maintenance, drying and finishing, embroidery making, and display/experience settings), visual materials (photographs of process steps, maps of research locations, and images from exhibitions and teaching activities), and textual materials (policy documents, journal articles and theses/dissertations, and ethnobotanical studies). This approach enhanced data completeness and the reliability of the study's conclusions (Figure 2).

Figure 2: Indigo preparation and vat setup

Source: field photograph by the author

Table 1. Summary of interviewees and data sources (Source: drawn by the author)

Code	Name	Role/Identity	Location	Interview date	Consent	Data type
P1	Lei Lai	A practitioner of Dong cloth safeguarding and innovation and the founder of a Dong cloth workshop.	Rongjiang, Guizhou	2022-09-28	Oral consent; audio recorded	Semi-structured interview
P2	Xianrong Yang	A county representative inheritor of Dong dress-making techniques in Sanjiang.	Sanjiang, Guangxi	2025-04-11	Oral consent; audio recorded	Semi-structured interview

P3	Dongjuan Shi	A municipal-level inheritor of Dong embroidery in Sanjiang County.	Sanjiang, Guangxi	2025-03-07	Oral consent; audio recorded	Semi-structured interview
D1	Field sites	Comprise village- and township-level research locations	Rongjiang and Sanjiang	2022-2025（repeated visits）	—	Participant observation; photos; process mapping
V1	Photos	V1 visual materials include maps, documentation of indigo-making and dyeing/finishing procedures, and cultural-creative displays.	Photographs were collected in Rongjiang, Sanjiang, and at Guangxi Innovation Design Week	2023	—	Photographic documentation

A unified coding system is used in the table: P (participant) denotes interviewees/interview participants (e.g., P1, P2, P3); D (data source) refers to field sites and process documentation as data sources (e.g., D1); and V (visual data) indicates visual materials such as photographs and video (e.g., V1). This system allows the main text to cite interview or observational materials directly using codes such as "P1" and "P2," which correspond to the appendix entries, thereby ensuring clear referencing, a coherent structure, and a verifiable evidence chain. Ethical information is consistently reported, in line with field practice, as "Oral consent; audio recorded," and data types are clearly distinguished as semi-structured interviews, participant observation/process mapping, and photographic documentation. Together, these elements provide direct support for the Methods section's discussion of how multi-source data are triangulated (Table 1).

4. Findings

4.1. Process Characteristics of the Integrated Dyeing–Finishing Technique in Dong Cloth Plant Dyeing

Field evidence indicates that Dong plant dyeing is not a single act of "coloring," but a continuous chain consisting of indigo preparation and vat setup, repeated immersion dyeing and sun-assisted oxidation, localized shade adjustment and re-dyeing, and finishing steps such as sizing and beating to enhance luster. Xianrong Yang emphasized that whether the vat is "alive" directly affects dye uptake and color quality; the fermentation cycle fluctuates between 7 and 15 days depending on weather conditions. During dyeing, multiple rounds of immersion and drying produce a stable deep-blue ground, while repeated beating improves penetration and evenness. Lei Lai likewise noted that turning cotton into finished cloth involves many procedures, and that the key finishing stage requires prolonged beating for the textile to become both supple and

glossy. According to Editorial Office of Jiancha Fengyun (2025), written process records indicate that post-indigo finishing—egg-white beating and glue sizing—creates Dong cloth's distinctive sheen and durability. Taken together, these sources show that the core of Dong plant dyeing lies in the integration of dyeing, textile making, and finishing; therefore, safeguarding should cover critical nodes across the process chain rather than focusing only on the final color outcome.

4.2. The technique relies on local environmental, seasonal, and experiential factors

Evidence from both regions consistently shows that vat maintenance, the formulation of plant ash, the use of rice wine to support fermentation, the number of dye dips, and oxidation time are largely determined through experiential judgment. Yang stressed that ratios "rely entirely on experience," and that readiness is assessed through cues such as foam conditions, color changes, and the "breath" or "feel" of the vat. This finding implies that simply replicating procedural steps—without the local water quality, temperature and humidity conditions, raw-material states, and seasonal management practices—often leads to unstable results. In other words, the "transmissibility" of Dong plant dyeing lies not only in techniques as such, but also in the ability to interpret and control contextual parameters.

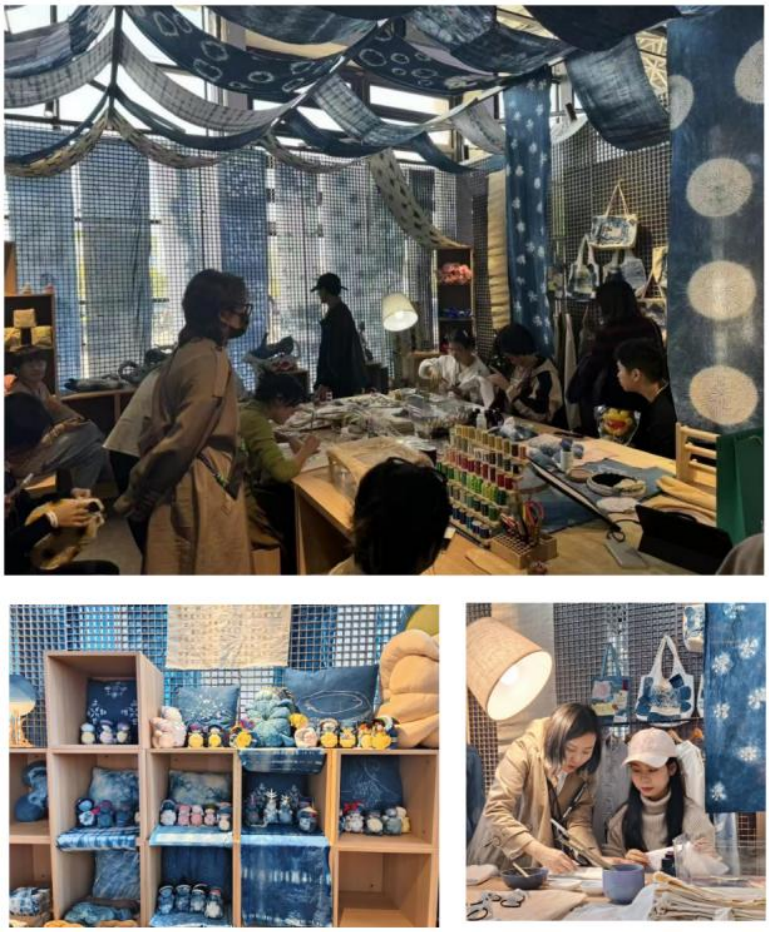
4.3. Transmission occurs through daily labor, led by women's networks and household production

Yang explained that traditional production begins with cotton cultivation and extends across the four seasons; "eighteen steps of Dong clothing" is only a shorthand, while actual practice includes many finer-grained procedures. Weaving also requires neighborhood cooperation for tasks such as warping and heddling. Moreover, the dowry system historically tied the craft closely to women's life courses, forming a collaborative transmission network structured through household, kinship, and community relations. Lei Lai's contemporary practice—"dyeing-and-weaving workshops: bringing mothers back home"—reconstructs household-based production through training and distributed collaboration, enabling women to work from home and gain a sense of value. This case illustrates how productive safeguarding can also contribute to repairing and strengthening social structures. Overall, the continuity of Dong plant dyeing depends on living arrangements and social organization rather than isolated skill demonstrations.

4.4. From Everyday Cloth to Cultural-Creative Products and Experiential Communication

Field and visual materials show that contemporary development of Dong plant dyeing often proceeds through a dual shift toward productization and experience-making. On the one hand, it enters the cultural-creative, design, and fashion spheres as a consumable cultural product. On the other, it is communicated through event-based settings—exhibitions, workshops, experience centers, and design weeks—supporting participatory dissemination and public education. Documentation from the 2023 Guangxi Innovation Design Week (Figure 3) suggests that combining display with teaching for indigo-dye cultural-creative products can markedly increase social visibility and learning opportunities. At the same time, such settings may encourage simplification centered on visual effects, compressing a complex process chain into quickly displayable fragments and thereby creating risks to process integrity.

Figure 3: Works in the 2023 Guangxi Innovation Design Week: Indigo-dyed cultural and creative works.



Source: photograph by the author

4.5. "Color–care–healing" narratives activate cultural meaning: authenticity stems from sustained practice rather than static display

Based on fieldwork conducted in Sanjiang Dong communities and interviews with local woman Xianrong Yang, indigo cloth is understood to embody practices of bodily care and everyday experience—for instance, wrapping newborns or covering the body during illness—thereby transforming indigo from a dye material into a medium of lived belief and healing. She also explained that traditional garments are washed less frequently and are mainly cared for through ventilation and sun-drying, reflecting a localized care system aligned with the material properties of indigo textiles. Dongjuan She's oral account indicates that motifs such as crabs, pomegranates, mandarin ducks, and the "double happiness" symbol are closely tied to the symbolic system of weddings. Even in contemporary innovation, cultural continuity is maintained through narrative meanings attached to these motifs. Taken together, the "authenticity" of Dong plant dyeing relies more on continued use, storytelling, and intergenerational practice than on museum-style preservation alone.

5. Discussion

Drawing on both the literature and field evidence, this study argues that safeguarding and developing Dong plant dyeing for Dong cloth requires addressing three core issues

simultaneously: the integrity of the process chain, the articulation of context-dependent knowledge, and community agency with appropriate governance arrangements. First, from a craft-practice perspective, safeguarding should focus on maintaining the process chain.Dong cloth achieves its distinctive color depth and sheen through repeated indigo dyeing and subsequent finishing.Fieldwork in this study further shows that key knowledge is concentrated in high-threshold nodes such as vat management and finishing. Therefore, safeguarding should not be limited to preserving finished products or patterns; it should establish a checklist of critical nodes—such as criteria for assessing vat "activity," immersion–oxidation cycles, beating duration, and the selection of sizing materials—and document the underlying decision logics.

Second, in terms of development, it is necessary to strengthen the "parameter–performance" evidence chain. The literature has repeatedly noted the lack of quantifiable links between key variables and performance outcomes (Tian, 2015; Wu, 2020), and this study likewise finds that experiential judgment largely determines process stability. This paper proposes a form of "gentle standardization" that does not undermine traditional logics: building on inheritors' experience, key variables can be translated into teachable expressions, and basic indicators—such as color fastness, wash and light resistance, and luster stability—can be gradually introduced for training and quality assessment, rather than replacing the craft through industrial production.

Third, at the governance level, community agency and benefit mechanisms should be strengthened. The institutionalization of intangible cultural heritage creates opportunities for resource allocation (State Council of the People's Republic of China, 2014), yet integration with culture and tourism may also produce tensions around "authenticity" (Peng, 2024). Fieldwork shows that workshops, associations, experience centers, and exhibition activities have indeed expanded communication and employment. However, without community interpretive authority and stable benefit-sharing arrangements, the craft is easily reduced to consumable symbols. A collaborative mechanism involving "community–inheritors–design/education institutions–tourism platforms" is therefore recommended: the community should lead in defining display boundaries, setting principles that core procedures must not be simplified, determining benefit-return ratios, and establishing training systems, thereby achieving a sustainable balance between safeguarding and development.

Finally, at the level of ecological resources, dye plants and environmental conditions should be incorporated into systematic safeguarding. Ethnobotanical research has highlighted the ecological knowledge value embedded in Dong dye-plant systems (Liu et al., 2014), and policy has also emphasized the holistic framework of cultural-ecological protection areas. Accordingly, safeguarding Dong plant dyeing should include dye-plant resources, cultivation/collection arrangements, and community rules for ecological management, avoiding an approach that operates only at the level of "cultural display."

6. Conclusion

Focusing on field sites in Rongjiang Guizhou and Sanjiang Guangxi, this study draws on interviews, participant observation, visual materials, and literature analysis to examine safeguarding and development pathways for Dong plant-dyeing practices in dress, with indigo dyeing of Dong cloth as the core case. The findings show that Dong plant dyeing is, in essence, an integrated dyeing–finishing system, in which color depth, luster, stiffness, and durability are co-produced through the entire process chain. The

practice relies heavily on local ecological conditions and experience-based parameters, and it is embedded in women's labor networks as well as household and community production structures. Meanwhile, the institutionalization of intangible cultural heritage and the integration of culture and tourism create new opportunities for dissemination and employment, but they also introduce staging effects and tensions around authenticity.

On this basis, the paper offers five recommendations for sustainable development: (1) strengthen the protection of dye plants and ecological resources to secure the material foundations of the craft; (2) improve community-centered skills education to reinforce learning networks and intergenerational transmission; (3) advance a "parameter–performance" evidence chain and gentle standardization to enhance teachability and communication about quality; (4) build culture-and-tourism collaboration and market mechanisms on the premise of community agency to avoid symbolic commodification; and (5) reinforce policy support and international exchange to strengthen scholarly dialogue and cross-cultural communication. Overall, the future of Dong plant dyeing should not be reduced to either "preserving tradition" or "expanding the market." Instead, it requires coordinated attention to process-chain integrity, community structures, and contemporary communication mechanisms in order to achieve living transmission and innovative development.

Ethics Approval and Consent to Participate

The researchers used the research ethics provided by Research Ethics Committee of Universiti Malaysia Sabah (RECUMS). All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional research committee. Informed consent was obtained from all participants according to the Declaration of Helsinki.

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Conflict of Interest

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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