



A Study on the Regeneration of Industrial Heritage Parks from a Symbiotic Perspective: The Case of Qingdao Textile Valley

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Abstract. As a significant remnant of Qingdao's modern textile industry, Qingdao Textile Valley embodies a profound industrial heritage; however, it currently faces practical challenges such as a chaotic spatial layout, insufficient revitalisation of industrial heritage, a fragile ecological foundation, a lack of commercial vitality, and an incomplete landscape system. Adopting a symbiotic theory as the research framework and analysing the current conditions of the Qingdao Textile Valley site, this paper identifies three key renovation orientations: contextual symbiosis, ecological symbiosis, and industry-city symbiosis. It proposes targeted implementation measures across three dimensions: the conservation and cultural translation of industrial heritage, the ecological restoration of degraded sites, and the optimisation of multifunctional spatial integration. The study aims to provide practical, actionable guidance for the landscape regeneration of Qingdao Textile Valley. It offers theoretical references and practical insights for the coordinated development of cultural heritage preservation, ecological restoration, and industry-city integration in similar industrial heritage sites.

Keywords: industrial heritage; symbiosis theory; Qingdao Textile Valley;

1 Introduction

Industrial heritage constitutes a cultural landscape bequeathed by human history^[1]. Industrial sites, as important carriers of industrial culture, play a crucial role in the development of industrial culture^[2]. With the decline of traditional industry and the acceleration of urban regeneration, the conservation and adaptive reuse of industrial heritage have become crucial issues for the preservation of industrial culture^[3]. Against the backdrop of urban renewal and the pursuit of high-quality development in China^[4], the transformation and upgrading of traditional industries and the continuous deepening of industrial restructuring have led to the closure and relocation of a large number of old factories that once supported the industrialization process. Some of them have been destroyed or even destroyed, while others have

gradually transformed into industrial heritage^[5]. The protection and reuse of industrial heritage in China is plagued by issues such as ‘prioritising development over conservation, form over substance, and single-function use over systemic synergy’. Some regeneration projects have resulted in a rupture of historical context, ecological deficits, functional isolation and excessive commercialisation, making it difficult to achieve a long-term win-win situation between heritage conservation and urban development.

As a core remnant of Qingdao’s modern textile industry, Qingdao Textile Valley possesses a complete complex of industrial buildings, production facilities and site fabric, and stands as a significant representative of the cultural heritage of Qingdao’s ‘mother industry’^[6]. In the current regeneration efforts, whilst the park has tentatively established a multi-functional system centred on textile culture, practical contradictions remain, including chaotic spatial layout, insufficient revitalisation of industrial heritage, lack of commercial vitality and the absence of a landscape system. Consequently, it has failed to form an organic whole where history, ecology, function and industry develop in synergy.

Guided by the core principles of coexistence, dynamic equilibrium and mutual benefit, the theory of symbiosis provides a systematic analysis of the current issues facing Qingdao Textile Valley. It defines three key renovation orientations—contextual symbiosis, ecological symbiosis and industry-city symbiosis—and proposes actionable landscape renovation strategies. The aim is to provide a foundation for the sustainable regeneration of Qingdao Textile Valley^[7], whilst enriching the application of symbiosis theory in the field of industrial heritage conservation and reuse^[8], whilst offering a theoretical framework and practical model for the conservation and adaptive reuse of similar industrial heritage sites across China.

2 Core Concepts of Symbiosis Theory and Analysis of the Current Situation in Qingdao Textile Valley

2.1 Symbiosis Theory

In academic research exploring the multifaceted relationships between humans and nature, society and the economy^[9], the theory of symbiosis has gradually emerged as a novel perspective. It advocates the concept of interdependence and harmonious coexistence among various systems, offering new approaches to solving complex problems.

Symbiosis is one of the most universal phenomena in nature. Originally a concept within the field of ecology, it was first proposed in 1879 by the German mycologist Anton de Bary, who defined ‘symbiosis’ as the coexistence of different species, involving continuous exchange of matter and transfer of energy between them. Caullery and Lewéillé defined it as a concept describing the interrelationships between organisms of various species, encompassing symbiosis, parasitism,

mutualism and other forms, and regarded symbiosis as a biological phenomenon universally present in the living world^[10].

The core of the symbiosis theory lies in its emphasis on ‘diverse coexistence, dynamic equilibrium, and mutual benefit’. The differences and unique characteristics between different systems, cultures or entities should not be viewed as barriers or oppositions, but rather as potential complementary strengths that can be transformed into a driving force for shared development through cooperation and dialogue. Therefore, symbiosis is not merely mutual benefit on a material level, but rather a state of harmonious coexistence achieved on a spiritual level, providing new insights for urban regeneration planning.

2.2 Analysis of the Current Situation at Qingdao Textile Valley

Qingdao Textile Valley is situated along the core development axis of the old city centre in Shibei District, Qingdao. It enjoys an advantageous location and convenient transport links, combining a rich heritage of the textile industry with the potential for diversified industrial development. The park covers an area of approximately 490,000 square metres and retains a large number of industrial heritage sites, including factory buildings, water towers and ancillary facilities dating back to the 1930s, serving as important physical testimonies to the development of Qingdao’s modern textile industry.

During the regeneration process, the park has begun to take shape as a mixed-use complex centred on textile culture, integrating industry, education, exhibition and commerce. However, judging by the current state of overall operations and the spatial environment, the park still faces a series of issues, including loose spatial organisation, an irrational functional layout, insufficient revitalisation of industrial heritage, weak commercial vitality and an incomplete landscape system. There is room for further improvement in spatial quality, cultural prominence and comprehensive service capabilities.

2.2.1 The Spatial Layout Lacks Systematic Planning, and Circulation Patterns Are Disorganised.

Textile Valley is situated along Siliu South Road in Shibei District, positioned on a key urban development axis and connected to multiple rail transit lines and urban expressways, offering excellent external transport links. Internally, the park is built upon the site of a former industrial estate, featuring a large spatial scale and extensive coverage; however, the overall spatial layout lacks systematic planning. Functional zones are poorly defined, with different functional areas overlapping, resulting in chaotic circulation patterns; The hierarchy of internal roads is unclear, and the signage and wayfinding system is either absent or lacks sufficient clarity, resulting in poor spatial accessibility and directional guidance (Figure 1). Furthermore, parking space is limited in the entrance area, and signage for secondary entrances is missing (Figure 2). Public service facilities are clearly inadequate, making it difficult to support the

efficient operation of the park and meet the demands of mixed-use development. The overall spatial order and rationality of the layout urgently require optimisation.



Fig. 1. Signage within the park



Fig. 2. Unclear signage at secondary entrances

2.2.2 Inadequate Maintenance of Industrial Buildings and Limited Revitalisation Models.

The existing industrial buildings within the park—including factory buildings, power stations, staff accommodation and water towers—were mostly constructed in the 1930s. Their overall structural integrity is relatively well-preserved, and they possess outstanding historical value, serving as the park’s most distinctive cultural assets. However, due to prolonged use and the passage of time, some industrial buildings and structures have deteriorated and become damaged, with insufficient maintenance efforts. The models for the reuse of factory spaces are relatively limited; historical fabric and industrial symbols have not been effectively integrated with contemporary functional requirements. The cultural, artistic and practical value of the architectural spaces has not been fully realised, and there is a lack of a coordinated strategy that fosters synergy between heritage conservation and revitalisation.

2.2.3 Homogeneous Commercial Formats and Insufficient Long-Term Operational Vitality.

The park has organised numerous events centred on textile culture, such as fashion weeks and fashion buyer festivals, establishing a certain brand foundation and market visibility. However, commercial operations generally exhibit pronounced short-term effects and a lack of long-term appeal, with limited sustainability of events and brand influence. Commercial formats are monotonous and highly homogeneous; initial planning lacked a coordinated layout, resulting in some premises remaining vacant for

extended periods or performing poorly (Figure 3). The park's supporting commercial infrastructure is underdeveloped, and it has failed to form a commercial cluster that synergises with the surrounding urban areas. Consequently, overall commercial vitality is lacking, making it difficult to sustain footfall and hindering improvements in the park's overall performance.



Fig. 3. Unopened retail premises within the park

2.2.4 Monotonous Landscape Types; Weak Ecological Foundation and Landscape System.

The park's existing landscape system is relatively weak, dominated by ivy and plane trees. The landscape types are monotonous and lack spatial layering, making it difficult to meet the experiential needs of a diverse audience. The landscape lacks interactivity, engagement and functionality, and there is a low degree of integration between the landscape and spatial functions or cultural themes. Certain landscape features, such as graffiti (see Figure 4), sculptures and installation art, have deteriorated and become damaged due to natural wear and tear and a lack of maintenance. The night-time lighting design is simplistic, resulting in a poor quality of the night-time environment. During the landscape development process, insufficient consideration was given to ecological and sustainability aspects; there is a lack of green spaces and ecological restoration measures, and a symbiotic landscape system that is culturally distinctive, functionally integrated and ecologically friendly has not been established.

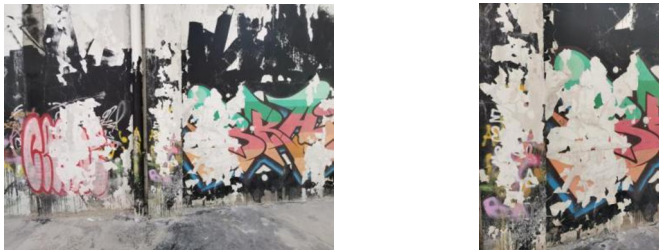


Fig. 4. Severe damage to the graffiti wall

3 Positioning and Principles for the Renovation of Qingdao Textile Valley from a Symbiotic Perspective

Based on the core tenets of symbiosis theory—‘multiple coexistence, dynamic equilibrium, and mutual benefit’—and in light of the site’s character as a century-old industrial heritage, the regeneration of Qingdao Textile Valley must transcend mere spatial beautification and functional replacement. It should take the three core elements of ‘historical context, natural ecology, and social life’ as symbiotic units to construct an organic symbiotic system characterised by ‘the interweaving of time and space, ecological mutual support, and the integration of industry and the city’. By reshaping the site’s texture, revitalising industrial memory, restoring the ecological foundation and connecting diverse stakeholders, the project aims to achieve deep synergy between industrial heritage conservation and urban regeneration, traditional cultural context and modern functions, and the built environment and natural systems. This will transform the Textile Valley into a model demonstration area for symbiotic industrial heritage landscapes that preserves urban memory, showcases textile culture and empowers the creative industries.

3.1 Symbiosis of Cultural Heritage

Guided by the core principle of ‘coexistence of old and new’, the project delves deeply into the century-old cultural heritage of the Textile Valley’s ‘mother industry’. It fully preserves and revitalises key historical elements such as the German Bauhaus architectural complex, the red-brick promenade, the remnants of textile machinery, and Guomian Avenue, thereby maintaining the authenticity and spatial integrity of the industrial heritage. Rejecting fragmented regeneration approaches, we treat historical structures, industrial textures and production memories as the core symbiotic elements of the landscape system. Through a progressive regeneration pathway of “preservation—restoration—translation”, we transform old factory buildings, outdated equipment and historic squares from mere historical specimens into tangible, participatory and narrative-rich landscape mediators. Simultaneously, by integrating modern landscape language and functional elements, a symbiotic order of “historical corridors—experiential nodes – creative districts” is established along the spatial sequence. This allows the century-old textile heritage to interpenetrate with modern design aesthetics and urban life narratives, mutually enhancing one another to form a landscape dialogue system that transcends time and space, thereby reinforcing the identity and historical legacy of Qingdao’s industrial culture.

3.2 Ecological Symbiosis

Addressing the ecological challenges inherent in the Textile Valley as a former industrial site—such as soil contamination, monotonous vegetation and disrupted hydrological cycles—the project adheres to the principle of “ecology first, coexistence with nature” to implement a landscape rejuvenation grounded in

ecological restoration. By establishing a multi-tiered symbiotic model of “ecological buffer—restoration and purification—landscape integration”, salt-tolerant and pollution-resistant native plants are utilised to create rain gardens and phytoremediation zones, thereby restoring the damaged soil and hydrological environment of the industrial site; We have opened up ecological corridors within the park to link existing green spaces with the urban ecological network, thereby reconstructing a complete green space ecosystem. Industrial facilities have been repurposed as ecological landscape installations; for instance, disused textile pipelines have been transformed into vertical greening structures, whilst the roofs of old factory buildings have been converted into ecological gardens, achieving a morphological symbiosis between industrial heritage and natural vegetation. Through low-intervention, high-adaptability ecological design strategies, we balance site ecological restoration with landscape creation, transforming the relationship between man-made landscapes and natural ecosystems from one of opposition to one of mutual support. This fosters a self-sustaining, dynamically balanced ecological symbiosis, enhancing the sustainability and ecosystem services of the landscape system.

3.3 Industry-City Symbiosis

Guided by the principle of ‘industry-city integration and functional symbiosis’, we break down the functional barriers between industrial parks and urban public spaces. The landscape system no longer serves merely industrial offices but acts as a symbiotic link connecting ‘creative industries, cultural tourism and community life’. Through the design of composite and flexible spatial functions, we construct a symbiotic spatial structure comprising ‘industrial office zones, cultural experience zones and public leisure zones’. Core landscape nodes, such as the three major squares and the arts district, will be developed into composite symbiotic spaces that integrate industrial exhibition, cultural exchange, civic leisure and visitor experiences, enabling designers, entrepreneurs, residents and tourists to share the space and interact. By using landscape to invigorate industry and industry to enhance the value of the landscape, we achieve a mutually beneficial outcome where the creative economy thrives and the quality of urban public spaces is elevated. This will drive the transformation of the Textile Valley from a single-industry park into an urban symbiosis characterised by “thriving industry, flourishing culture, ecological liveability and shared vitality”, establishing it as a model of industrial heritage-driven urban regeneration.

4 Renovation Strategies for Qingdao Textile Valley from a Symbiotic Perspective

4.1 Optimising Spatial Functional Layout to Create a Linear Cultural Landscape Corridor

Optimise the functional layout of the park, comprehensively reorganise the internal road system, and establish a three-tier road network comprising main park roads, secondary footpaths and courtyard paths, thereby achieving the separation of pedestrian and vehicular traffic and the distinction between fast and slow routes, thereby enhancing safety and comfort of passage; Unify the planning and improve the signage and wayfinding system. Install directional signs, information boards and site maps at entrances, intersections and key landscape nodes that combine textile cultural characteristics with high recognisability, thereby strengthening spatial orientation and accessibility and resolving the issues of visitors and residents getting lost or struggling to locate specific points.

Optimise the layout of the park's entrances and car parks; expand parking capacity at the main entrance; install signage and create drop-off areas at secondary entrances; and rationally plan parking zones for motorised and non-motorised vehicles to alleviate congestion at entrances and parking shortages. Address shortcomings in public service facilities by installing additional amenities—such as seating, vending machines, public toilets, information desks and first-aid stations—in high-traffic areas to meet diverse user needs.

Taking Guomian Avenue, the Red Brick Corridor, the Old Factory Building Axis as the framework, create a linear cultural landscape corridor spanning the entire park, linking core industrial nodes such as the old factory buildings, water tower, textile machinery relics, cultural square and art district. By retaining industrial paving, incorporating cultural installations and installing narrative feature walls, form a continuous and complete historical and cultural experience route, allowing visitors to immerse themselves in the development of Qingdao's textile industry and the site's memories as they walk through.

Flexible nodes will be designed to accommodate industrial operations, cultural festivals and everyday leisure activities, ensuring dynamic adaptation of spatial functions. The openness and connectivity of the space will be enhanced, improving the overall spatial order and quality of use.

4.2 Categorised Protection of Industrial Heritage and Interpretation of Textile Cultural Landscape Symbols

Conduct a graded assessment and categorised protection of the site's textile workshops, warehouse buildings, production equipment and industrial paving textures. Adhering to the principles of structural priority, preservation of original appearance and minimal intervention, carry out structural reinforcement and conservation-oriented repairs on core heritage elements such as the German Bauhaus-style workshops dating from the 1930s, the red-brick colonnade, the water

tower, the chimney, old power generation equipment and textile machinery. The focus will be on restoring the red-brick texture of the façades, steel and timber components, window mullion designs and roof features, whilst preserving the original industrial scale, spatial layout and traces of production. Excessive demolition, alteration and imitation construction will be strictly prohibited to fully maintain the authenticity and historical integrity of the industrial space.

By delving deeply into the century-old cultural heritage of Qingdao's textile industry, we systematically extract typical industrial symbols and spatial characteristics—such as yarn, fabric textures, shuttles, spindles, rollers, textile machine gears, thread paths, and fabric weave textures, and systematically translating these into a modern landscape language. These elements will be extensively applied in the design of site paving, landscape structures and art installations. Through material contrasts, formal echoes and narrative integration, industrial memories will be woven into contemporary spatial contexts in ways that are perceptible, interpretable and experiential. Whilst preserving core industrial heritage, the project incorporates composite functions such as cultural exhibitions, creative experiences and public leisure. This transforms old factory buildings from closed production spaces into open cultural venues, converting industrial architecture and facilities from static historical specimens into dynamic landscape carriers that disseminate culture, serve public life and highlight urban memory, thereby achieving a symbiotic fusion of historical heritage and modern functionality.

4.3 Integrating Business Formats and Functions to Create Public Spaces Shared by Industry and the City

With the objectives of industry-city integration, functional complementarity and shared vitality, we will break down the barriers between industrial spaces and urban public spaces. By optimising the layout of business formats, enhancing spatial openness and fostering links with surrounding communities, we will transform the Textile Valley into a composite, symbiotic space that serves the creative industries, hosts cultural experiences and benefits the lives of citizens.

We will review existing commercial offerings, phasing out homogeneous and low-vibrancy outlets. The retail mix will be restructured around four key themes: textile culture, creative design, intangible cultural heritage experiences, and light dining and leisure. This will involve introducing textile cultural and creative shops, industrial-style cafés, intangible cultural heritage craft workshops, and designer brand concept stores. Supplement community-oriented offerings such as public services, family-friendly experiences and sports and leisure facilities. Add 24-hour convenience stores, self-service kiosks, children's play areas and fitness trails to meet the daily needs of local residents and boost long-term footfall.

Establish a park-community linkage mechanism, regularly organising public events such as industrial culture festivals, textile intangible cultural heritage workshops, civic arts festivals and weekend markets to create established event brands and sustainably boost footfall. Establish a shared service platform to consolidate resources such as meeting rooms, exhibition halls and event venues, offering them to

businesses, communities and social organisations at low cost or on a charitable basis, thereby achieving efficient utilisation of spatial resources and a win-win outcome for all parties.

4.4 Restoring the Site's Ecosystem: Integrating Industrial Heritage with Ecological Landscapes

Addressing issues such as the degraded physicochemical properties of the site's soil, monotonous vegetation structure, poor hydrological circulation, and the disconnect between ecology and landscape, we will carry out ecological restoration and landscape reconstruction in a phased manner, guided by the principles of low disturbance, localisation, feasibility and ease of maintenance, to achieve ecological symbiosis between the texture of industrial heritage and the natural ecosystem.

Conduct a comprehensive assessment of soil conditions in the former production and storage areas, with a focus on detecting levels of contamination and salinisation. Implement phased remediation using three low-cost techniques: in-situ passivation, phytoremediation and organic soil amendment. Prioritise the use of Qingdao's native salt- and pollution-tolerant plants, such as *Salicornia*, *Phragmites* and *Tamarix*, for soil purification. A three-tiered 'sponge city' infrastructure comprising rain gardens, ecological retention ponds and vegetated swales will be established. Linear ecological drainage strips will be laid along the main roads and around buildings to collect rainwater from roofs and road surfaces. After filtration, sedimentation and purification, this water will be reused for irrigation of greenery and landscape replenishment, thereby restoring the site's disrupted hydrological cycle.

Convert disused textile pipelines, ventilation shafts and steel frameworks into vertical greening structures, planting climbing plants such as Virginia creeper, English ivy and pothos to create industrial-style vertical green walls, softening the hard texture of the buildings and increasing green coverage. Roof gardens and aerial viewing platforms will be created on the roofs of old factory buildings and water tower platforms. Lightweight planting soil will be laid, and succulent plants of the *Crassulaceae* family and ornamental grasses will be planted to create ecological leisure hubs. Abandoned textile machinery, spindles and old rollers will be combined to form ecological art installations, with flower boxes embedded to grow flowers, achieving an integrated presentation of industrial heritage and ecological landscape.

By integrating green space resources both within and outside the site, establishing ecological corridors and connecting to the urban ecological network, we will construct an ecological framework where man-made landscapes and natural vegetation interpenetrate and maintain a dynamic balance, thereby achieving a mutually beneficial symbiosis between the industrial environment and natural systems.

5 Summary

This paper focuses on the core issues of industrial heritage conservation and reuse, taking Qingdao Textile Valley as a specific case study. Addressing the site's current conditions—where industrial heritage is abundant but its cultural context remains underutilised, the ecological foundation is weak, and the functional layout is monotonous and disconnected from the urban fabric—it proposes concrete renovation measures based on the core principles of symbiosis theory. As a physical carrier of the city's historical context, the conservation and adaptive reuse of industrial heritage should not be confined to mere restoration or functional replacement. Instead, it should be grounded in the concept of symbiosis, achieving multi-faceted synergy and mutual benefit among historical context, natural ecology, modern industry, and public life.

The landscape regeneration strategy for Qingdao Textile Valley proposed in this paper, viewed through the lens of symbiosis, not only aligns with the site's actual conditions and addresses the core requirements of the regeneration but also refines the practical pathways for the conservation and reuse of industrial heritage. It provides actionable implementation guidelines for the landscape regeneration of Qingdao Textile Valley and offers new insights and references for the coordinated development of heritage transmission, ecological restoration, and industry-city integration in similar industrial heritage sites, thereby contributing to the high-quality development of urban cultural heritage and urban renewal.

References

1. Ministry of Industry and Information Technology Notice on Issuing the Interim Measures for the Administration of National Industrial Heritage[EB/OL].
https://wap.miit.gov.cn/jgsj/zfs/wjfb/art/2020/art_6bdfd465dc2943e2a4a33bc2cbf52b28.html
2. Guo Daqian. Research on Landscape Renewal Design of Industrial Sites Based on Local Theory: Taking Shenyang High Voltage Switchgear Factory as an Example [D]. Lu Xun Academy of Fine Arts, 2025. DOI: 10.27217/d.cnki.glxmc.2025.000302.
3. Ministry of Industry and Information Technology Notice on Issuing the Measures for the Administration of National Industrial Heritage[EB/OL].(2023-03-14)[2026-06-25].
https://www.mct.gov.cn/preview/whhlyqyzcxxfw/wlrh/202306/t20230612_944432.html
4. Love in Sichuan Province Guangming Daily vigorously implements urban renewal to promote high-quality urban development[EB/OL].(2025-03-13)[2026-06-25].
http://scdfz.sc.gov.cn/gzdt/zyhy/content_172936.
5. China Economic Net Economic Daily There is great potential to make good use of industrial heritage[EB/OL].(2024-06-20)[2026-06-25].
http://www.ce.cn/xwzx/gnsz/gdxw/202406/20/t20240620_39043082.shtml.
6. People's Weekly website People's Daily From Single Manufacturing to Diversified Development of "Technology+Fashion+Green": A Century of Textile Transformation in Qingdao (Story of Building a Strong Country·Revitalization of Hundred Industries and Thousand Enterprises.[EB/OL].(2026-03-18)[2026-06-25].
https://www.peopleweekly.cn/html/2026/caijing_0318/266789.html.

7. Wang Zi.Exploration and Analysis of the Protection and Utilization of Qingdao Textile Industry Heritage: Taking Qingdao National Cotton Fifth Factory as an Example [D]. Donghua University, 2021.DOI:10.27012/d.cnki.gdhuu.2021.000360.
8. China Industrial News Network China Industry News The triple path of revitalizing industrial heritage[EB/OL].(2026-04-20)[2026-06-25].
https://dzb.cinn.cn/zggyb/html/2026-04/20/content_16_341126.htm
9. Shen Yucheng.Design of Industrial Heritage Cultural and Creative Industry Park Based on Symbiosis Perspective: Taking Beiba Street in Kuancheng District, Changchun as an Example [D]. Changchun University of Technology, 2024.
DOI:10.27805/d.cnki.gccgy.2024.000974.
10. Gao Changzheng, Yan Fang, Long Wenyan.Exploration of Industrial Heritage Transformation Model Based on "Symbiosis Theory"-Taking Luoyang Bearing Factory as an Example[J].Urban Development Research,2017,24(3):54-60.
https://kns.cnki.net/kcms2/article/abstract?v=YwS3ffssB6jw2tDZ_4F6zzEJsv1q-UVUertYDM-Xej2dPmTo7TNNuGyaKtsdwpHChQBsupUJs0WQ_DcfbVNOMrse4MBFgAym7SzlN-ZIGxIrtmMm7eYTNDnn5YVND80nzKhXAgENqEQJ_1lkWQApSAmhQaXHdMi4nacduIAhtSDnphGrEu8kA==&uniplatform=NZKPT&language=CHS.

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