
Tomioka Silk Mill (Japan) No 1449

Official name as proposed by the State Party

Tomioka Silk Mill and Related Sites

Location

Cities of Tomioka (site S1), Isesaki (S2), Fujioka (S3) and the Shimonita Municipality (S4)
Gunma Prefecture
Japan

Brief description

The Tomioka silk mill dates back to the early Meiji period. With its related sites consisting of silkworm farms, a school and a cold storage facility (for silkworm eggs), it illustrates Japan's desire, a traditional producer of silk in the Far East, to rapidly adopt the best mass production techniques. The government imported machinery and industrial expertise from France in order to create an integrated raw silk production system in Gunma Prefecture. It included the production of eggs and their storage, silk worm farming in sericulture schools and the construction of a large mill for reeling and mechanised spinning. In turn, the Tomioka model complex and its related sites were a decisive element in the renewal of sericulture and the Japanese silk industry in the last quarter of the 19th century, and a key element of the country's entry into the modern industrialised world.

Category of property

In terms of categories of cultural property set out in Article I of the 1972 World Heritage Convention, this is a serial nomination of four *sites*.

1 Identification

Included in the Tentative List

30 January 2007

International Assistance from the World Heritage Fund for preparing the Nomination

None

Date received by the World Heritage Centre

31 January 2013

Background

This is a new nomination.

Consultations

ICOMOS consulted the TICCIH and several independent experts.

Technical Evaluation Mission

An ICOMOS technical evaluation mission visited the property from 24 to 26 September 2013.

Additional information requested and received from the State Party

ICOMOS sent a letter to the State Party on 27 September 2013 requesting additional information with regard to:

- Expanding the comparative study of the property with French and Italian sites involved in the production of raw silk;
- The possibility of reinstating disappeared sections of the sites using virtual recreation techniques;
- The human resources for the sites' management;
- The operation of the property's Coordination Committee.

The State Party sent additional documentation on 28 October 2013 which is taken into account in the present evaluation.

Date of ICOMOS approval of this report

6 March 2014

2 The property

Description

The historic sericulture and silk mill complex nominated for inscription on the World Heritage List is located in the south of Gunma Prefecture, a region lying to the northwest of Tokyo with alternating inland plains and mountainous terrain. The property includes four distinct sites that attest to the different stages in the production of raw silk: production of cocoons in an experimental farm (S2), a cold storage facility (eggs of the silkworm *bombyx mori*) (S4), reeling of cocoons and spinning of the raw silk in a mill (S1), as well as a sericulture school for the dissemination of sericultural knowledge (S3).

Part 1 (S1): The Tomioka raw silk mill

The Tomioka site is a large-scale industrial complex established in 1872 by the Japanese government with the contractual assistance of French companies and technicians from the Lyon region, at the time the leading centre for the industrialised production of silk yarn and silk mills in the West. It is located on the banks of the Kabura River. The mill is arranged around three large original buildings forming a squared U-shape open to the north. It reflects an architectural stylistic synthesis between the Western French traditions in the construction of factories, and traditional Japanese materials and styles. It gives substance to numerous technical and architectural innovations in Japan, as well as being the first appearance in the country of the large functional and mechanised factory for the mass production of textiles.

To the south, the large building for cocoon reeling and raw yarn production forms the heart of the factory. Measuring 140 metres long and 12.3 metres wide, it is orientated in

order to present the maximum amount of glazed façade to the natural sunlight. The openings are wide and their forms have been retained, following a restoration of the windows. The building has a wooden frame and the infill walls are in red brick. The timber roof frame is of European type, with a rigid structure, which was an innovation in Japan. The roof covering includes a raised ridge to allow for the natural ventilation of the building, which was a steam-filled place. The tanks, and the cocoon reeling machines and those which spun the raw silk yarn are still in place. The original machines were imported from France. The technical annexes are functionally arranged around this building, notably the six steam generating boilers, five for boiling cocoons and one to provide the motive power. These buildings are constructed in timber or brick.

To the east, a long building (104 m) was designated for storing and drying the cocoons, before they were reeled in the central building. Its built structure is of the same type, with numerous openings on three levels. The roof structure has a row of central pillars. To the west, a symmetrical building with the same proportions and technical functions sits opposite. It has an external covered gallery.

The original layout also included, outside this central U, various buildings for the staff, in particular the residence for the French instructors, an inspector's house and the residence of the director, Paul Brunat, set somewhat apart in the southeast. Colonial in style, this vast residence has a wide wrap-around veranda. It was subsequently converted into a dormitory and a school.

In addition to the original buildings still present, various remains of structures illustrate this initial period of the mill: the base of the boiler plant chimney, the position of the six wells supplying water for the boilers, a large sheet metal tank on its foundations and a large masonry drain to collect the mill wastewater and channel it to the river.

At the very end of the 19th century, when the mill passed from the State into the hands of a private entrepreneur, several extensions were made: an additional workshop for raw silk reeling and hank storage, a second women's dormitory and four residences in the north.

However, various original buildings have not survived or have been demolished to make way for other facilities, in particular: the women's dormitories, a cocoon drying hangar, and the boiler buildings and reservoir in the east. Other old buildings (prior to 1908) have also disappeared, in particular the egg production laboratory and a large tank. The laboratory is now an archaeological site and its foundations have been unearthed.

In the course of the 20th century through to the end of the mill's operation in 1987, many small additional buildings were added as required, most of which have been preserved. They are small to average in size and their forms are compatible with the structures of the large original buildings which have not been altered.

Part 2 (S2): *The Tajima Yahei sericulture farm*

It is located near the Tone River, around 30 kilometres east of the mill (S1), in the locality called Shimamura. The soil was not very suitable for growing rice but tolerated mulberry plants well, whose leaves were harvested to feed the silk worm larvae. It bears the name of the agronomist who developed a new sericulture breeding method here known as *seiryō-iku*. It was a prototype farm, a place of experimentation and a school. The farm was also actively engaged in the production and sale of silkworm eggs.

The main building dates from 1863. Its architecture is characterised by two levels and a pitched roof with a raised ridge and large windows to create good natural ventilation. It is 28 metres long by 12 metres wide. It is a new functional type of architecture in Japanese sericulture. An annexe or "microscope room" served as a laboratory to monitor the health of the eggs and larvae. This building has undergone several alterations, mainly the disappearance of the entrance pediment.

The farm site also has a large barn for storing the mulberry leaves, an egg storage building, another for larvae hatching, a roofed well, a tool shelter, a *torii* (Shinto shrine gateway), and a monument commemorating a visit by the Empress Teimei. Various remains of foundations are located within the perimeter of the farm: another sericulture building extending from the existing building, another barn, and a hangar.

Part 3 (S3): *The Takayama-sha sericulture school*

It is located around 12 kilometres southeast of the mill (S1), near the city of Fujioka, on a river terrace at the foot of a wooded hill. Sericulture in this small valley dates from the Edo period (17th to the 19th centuries). A new farm was developed here at the start of the Meiji era (1875), encouraged by the setting up of the large Tomioka mill. The school was started by the agronomist Chogoro Takayama in 1884, to teach the *seion-iku* sericulture method.

The farm's original building was extended with a two-level construction to the east (1891), measuring 17 metres long. Its ground floor was used as a dwelling and the upper storey for silk worm breeding. Raised roof ridges provided ventilation. Originally, these buildings were entirely constructed in wood. Today, the roofs are tiled. The silkworm raising boxes and their shelves are still in place.

Near the main building, there is a covered gate, a small bathhouse and a kitchen. The foundations of other buildings, today disappeared, are discernible: a school, mulberry leaf barn, and a sericulture building. The location of the mulberry tree field has also been preserved.

Part 4 (S4): *Arafune cold storage site*

This is an archaeological site of egg storage cellars, at an altitude of 840 metres, west of the city of Shimonita. North-facing, the built structures in front of the cellars are

made of blocks of rock and artificially-piled rocks allowing subterranean air circulation. This provided coolness from the wet vegetation on the surface of the rock pile. This system controlled the temperature inside the three successive storage cellars, of which today only the thick stone foundations remain. The annual management of the placement of the eggs meant they could be kept at a constant temperature in order to manage when the larvae hatched. The successive cellars were built in the early 20th century; they were between 10 and 16 metres long and 4 to 6 metres wide. The surface buildings disappeared in the 1950s.

History and development

The technical mastery of silk yarn and its weaving dates from Chinese antiquity. China produced extremely luxurious fabrics that were traded on a grand scale in ancient times (along the Silk Road between the Far East and the Western Mediterranean).

The secret of Chinese silkmaking spread partially and slowly throughout the world, firstly without doubt to Japan, sometime in antiquity, and towards South East Asia; and then around the 10th century to the Byzantine Empire and the Islamic world; and finally to the western Mediterranean. In general, Chinese silks long remained the finest and the most sought-after. Silk production was encouraged in Japan from the Nara Period (8th century), as a luxury fabric for the court aristocracy and new social elites.

The start of the Edo Period (1603-1867) was marked by massive Chinese imports and later by their control. Silk production then started to develop in Japan and incentives were introduced by the Shogunates (17th century). Numerous improvement and innovation efforts were made throughout this period and treatises were written by agronomists. The central region of Honshu became an important sericulture region, and the discovery of Western techniques in the 19th century occurred at a dynamic time for the Japanese silk industry.

In the 17th-18th centuries, the centre of gravity of the European silk industry moved from Italy to France, in particular the Lyon region and its rural hinterland, which was suitable for raising silkworms. The mechanisation of reeling and spinning, with its early beginnings in Bologna in the 17th century, became an integrated industry in France, simultaneously producing mass quantity and quality by the end of the 18th century. Lyon then became the capital of the world's silk industry and its trade, and it dominated the market for specialist machinery (Vaucanson machines, Jacquard looms, etc.).

When the port of Yokohama opened in 1859, raw silk alone accounted for 65% of Japanese exports. The Meiji period (1868-1912) turned towards the outside world and showed Japan's desire to acquire the best Western industrial technologies (iron and steel, mechanical engineering, armaments, cotton, etc.), through actions directly supported by the government. In the area of silk, contact with the Lyon region occurred very early on. The

French industry, like the entire sericulture sector in Europe, was at that time affected by the *pebrine* silkworm disease which had not affected Japan. The search for raw silk ready for spinning and uncontaminated eggs was very vital. It was against this backdrop that a partnership was formed between Japan and France to develop reeling and raw silk spinning mills (1870). Tomioka was the pilot project, on a grand scale. It was to serve as the centre of training, thanks to French supervision under the direction of the engineer Paul Brunat (1840-1908).

The choice of Tomioka was dictated by the sericultural tradition of Gunma Prefecture, guaranteeing a sufficient number of cocoons and extensive local expertise, as well as the nearby presence of a coal mine. It was the architect Edmond Bastien (1839-1888), already employed to build Yokosuka Arsenal, another Franco-Japanese cooperation project, who drew up the plans and supervised the construction (1872).

The Tomioka mill and its imported machinery were rapidly taken as the model for many projects in the Gunma and Nagano regions. The machines were subsequently improved, becoming the reference for sericulture equipment for the region, and then rapidly became the most widespread in all Japan.

At the same time, the artisanal system remained dominant in silkworm breeding and several agronomists attempted to improve it, whilst avoiding any diseases. For example, Yahei Tajima developed a model farm in 1863 based on his *seiryō-iku* model (site S2), the first modern method in Japan. A little later, Chogoro Takayama created a farm and a school to teach a variant, *seion-iku* that was ultimately to dominate in this region (S3). The methods for controlling the temperature and ventilating the cocoon boxes were all-important. Chogoro worked with the Tomioka mill, improving the silkworm incubation processes and training thousands of sericulturists. The use of cooling in managing eggs appeared in the early 20th century, making the Arafune cold storage site (S4) one of the main silkworm egg distribution centres in Japan and increasing the length of the production period.

Tomioka and its productive environment became the site of innovation in managing and coordinating production, as well as the selection of silkworms by the introduction of the F1 hybrid (1911), and egg production. Japan thus became a leader in sericulture production and the world's leading exporter of raw silk, notably to France and Italy.

The Tomioka mill ceased workings in 1987. It was still owned by *Katabura Industries Co* which maintained it as it was until 2005, when ownership passed to the city of Tomioka.

3 Justification for inscription, integrity and authenticity

Comparative analysis

The international comparative analysis made by the State Party shows that the silk industry, in terms of heritage, and especially in the production of cocoons, and the reeling and spinning of raw silk, is not the subject of any inscription, nor specific to any projects on the national Tentative Lists. However, there are two types of recognition of silk and silk mills. The first is as one specific attribute of more all-embracing properties, generally via their urban, village or architectural values: the prototype silk milling site amongst the Derwent Valley Mills, United Kingdom (2001, criteria (ii) and (iv)) which was moreover a failure; the Historic Villages of Shirakawa-go and Gokayama, Japan (1995, criteria (iv) and (v)) which were traditionally devoted to silkworm breeding; the annex to the Royal Palace of Caserta, Italy, forming an industrial complex devoted to silk, silk mills and its trade (1997, criteria (i), (ii), (iii) and (iv)); the Historic Site of Lyons, France (1998, criteria (ii) and (iv)), a major centre for the international silk trade for several centuries; and finally, the small family silkworm farms in the Causses and the Cévennes, Mediterranean agro-pastoral Cultural Landscape, France (2011, criteria (iii) and (v)). The other sources mentioned show a relative marginalisation of silk heritage in Europe compared with other textiles, such as cotton or wool, and even the essentially architectural approaches of French companies.

The comparative study also references China's sericultural heritage, at the same period. It was also influenced by Western techniques and corresponds to similar contexts, for example, the imperial workshops for the production of raw silk and the Ruifeng industrial site in Suzhou, the Yongtai site in Wuxi, Husizhan in Shanghai, etc.

The local and national comparative analysis, using well-documented databases, reveals that the sites selected, from a clearly identified regional ensemble, justify the serial approach:

- The Tomioka mill forms the central component, justified by its historical precedence, its heritage importance and its historic role as the centre for the adaptation and dissemination of Western techniques, and then of Japanese innovations;
- The two sericulture schools are the best preserved and they illustrate technical and architectural innovations;
- The egg cold storage site, of which only vestiges remain, is the largest in Japan and illustrates an innovative aspect.

In its response of 28 October 2013, the State Party provided additional information about the technical systems used in other countries, mainly in France and Italy. But this is above all a comparison in historical terms, the heritage being reduced to a long list of sites.

ICOMOS considers that the comparative analysis is satisfactory at the national level and that the justification of the choice of sites has been made with extreme care.

ICOMOS considers that the comparative analysis justifies consideration of this serial property for the World Heritage List.

Justification of Outstanding Universal Value

The nominated property is considered by the State Party to be of Outstanding Universal Value as a cultural property for the following reasons:

- It is a unique and complete historical technical ensemble dedicated to the production of raw silk, egg production, silkworm breeding (silk farm), cocoon reeling and spinning on a grand scale.
- The Tomioka mill is the first example of a mechanised mill using automated machinery and steam power in Japan.
- The Tomioka mill provides rare and well preserved evidence of international technological exchanges during the industrial revolution, in the second half of the 19th century.
- Tomioka, the sericulture schools and the egg cold storage site illustrate a style of architecture blending foreign influences and local traditions to achieve greater technical efficiency. It gave rise to a style of industrial architecture specific to 19th century Japan.
- It is a model of international technological transfer that then spread rapidly throughout Japan, based on the foundations of ancient regional artisanal practices, out of the desire to spread industrial equipment and the associated expertise, through the notions of the industrial model and sericulture school.
- The rapid dissemination of the Tomioka model in Japan contributed decisively to the renewal of global sericulture production, making up for Western shortages caused by the *pebrine* silkworm disease. At this time, Japan contributed decisively to the growth of the world's silk market, in which it became a leading player.
- Tomioka and its complex contributed to the worldwide development of technology with its silkworm hybrid, silk farm ventilation, progress in automatic reeling and spinning machines and even the cooperative management between rural family producers and mass industry. In its turn, Tomioka became an international exemplar.
- Tomioka illustrates the shift from a state-directed economic model to private management and the birth of major independent economic groups.

The four sites nominated for inscription are complementary and each illustrates a technical and historic aspect of the Tomioka sericulture complex.

ICOMOS considers that this justification is appropriate because Tomioka is a fully accomplished example of the spreading of Western technology in the early years of

the Meiji period. It is both a technical and economic achievement, built on a foundation of traditional silk producers, in the heart of ancient Japan. All the various levels of the technical complex that was created, from egg production and storage to raising silkworms in sericulture schools, then automatic reeling of the cocoons and spinning in a large model factory built with French cooperation, are well represented. It was a model that spread rapidly in Japan and it became a centre of innovation and a model for the integrated production of raw silk.

Integrity and authenticity

Integrity

The series has been put together to illustrate the major components of the technical operation, ranging from the production of eggs and silkworm farming, to reeling of the cocoons and spinning the hanks of raw silk. It is also intended to highlight the international technological exchanges occurring at this time: on the one hand, the acquisition of Western technologies at the start of the Meiji period, and, on the other, the innovations and improvements made by the Tomioka mill and the Gunma region in the ensuing years.

The structural integrity of the Tomioka mill (S1) is comprehensible, as the major large industrial buildings are still present; the mill's land divisions have been retained and clearly define the property boundaries. The main technical annexes (boilers, well, drain, etc.) have left significant and sometimes well-preserved traces (metal tank, drain tunnel, etc.). Several staff facilities are still present, without having undergone any major architectural changes even if their use has changed over time. However, important places, such as the laboratory and egg reproduction area have not been preserved, and today exist only as archaeological traces that give little idea as to their past purpose.

The Tajima Yahei (S2) and Takayama-sha (S3) sericulture schools are mainly represented by their original buildings, with several annexes: the microscope room, the well and a barn (S2), and the old entrance gate (S3). The other buildings and structural components of these two properties now only exist as remains of foundations, which in themselves are not very evocative of their past functions. The land boundaries have been preserved. The Arafune cold storage site (S4) is essentially an archaeological site.

To understand the technical ensemble, good interpretation must be present at each of the sites, because whilst they are notable technical testimonies, it is above all the technical process and its context that is important, based on heritage components that are at times not very explicit in themselves or are reduced to the state of archaeological remains. Certain dimensions of the process are missing, such as the decidedly agricultural nature of silkworm farming, totally dependent on mulberry orchards which are no longer present at all.

ICOMOS considers that the integrity of the serial property is good, but that the structural and functional integrity of each of the components is uneven and at times difficult to understand. While it is relatively good for the Tomioka mill, where a large part of the machinery is still present (S1), and is still reasonable for the Tajima Yahei silk farm (S2), it is more debatable for the two other sites (S3 and S4): the first limited to the old central building and the second is an archaeological site that is relatively inexplicit by itself. The integrity of the landscape, in relation to the buffer zones, also requires particular attention.

ICOMOS considers that the integrity of the whole series and the integrity of its component sites are satisfactory.

Authenticity

For the Tomioka mill (S1), the land divisions have been preserved, providing an adequate indication of the scale and limits of the original property, and its extent. The main buildings have retained a good level of authenticity, even if they have undergone several transformations. The architectural language has been respected, notably with regard to the built structures, construction materials and functions. Buildings have been added, but in a manner that is respectful of the original large buildings and the initial structural arrangement of the space. These buildings are compatible with the existing built elements and complete its functions. Since the mill closed in 1987, it has been well conserved, both in terms of its architecture and its machinery. There is full conservation of the functional authenticity which is clearly visible to the visitor.

The two sericulture school sites (S2 and S3) have built components of obvious authenticity and their conservation has generally respected their initial state in terms of the forms, structures and materials. Their transformation into modern dwellings has had some limited effects, such as the closing off of the roof openings, but without altering the built forms. The internal technological components that have been preserved satisfactorily evoke silkworm farming and cocoon reeling. Whilst the positions of the demolished buildings are identifiable by their traces on the ground, their ability to evoke their former use is on the other hand very poor.

ICOMOS considers that the authenticity of the components presented is generally satisfactory in terms of its various dimensions of structure, form and materials, but it nonetheless suffers from a lack of integrity, already mentioned, regarding the two silk farms (S2 and S3). The Arafune site (S4) currently undergoing restoration must remain within a strictly controlled framework in terms of its authenticity, which must remain archaeological in nature.

ICOMOS considers that the authenticity of the whole series and the authenticity of the individual sites that comprise the series have been demonstrated.

ICOMOS considers that the conditions of integrity are relatively uneven between the sites that make up the series, but that they have generally been met, and that the conditions of authenticity have been met.

Criteria under which the inscription is proposed

The property is nominated on the basis of cultural criteria (ii) and (iv).

Criterion (ii): *exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design;*

This criterion is justified by the State Party on the grounds that the Tomioka complex shows an important exchange of scientific knowledge between Japan and different countries, with regard to silk production. Western technology for industrial integrated production was introduced at Tomioka as a pioneering project in Japan, under government initiative. The silk industry in Japan developed out of the Tomioka complex. This was subsequently prolonged by the global dissemination of modern sericulture techniques and machinery improvements from Japan. It is an exemplar of mutual exchanges that made it possible to achieve global mass production and high quality raw silk at the dawn of the 20th century, resulting in a technical culture with a global character.

ICOMOS considers that the Tomioka mill illustrates the early and entirely successful transfer of Western industrial sericulture techniques to Japan, by way of cooperation with France. Its success is based on a long regional tradition of silkworm farming and its rapid appropriation within a model integrated complex. This approach to sericulture was rapidly learned and copied in Japan where it underwent many technical improvements allowing the country to achieve a preeminent position in the global raw silk market at the dawn of the 20th century. Tomioka in its turn became a centre for the dissemination of sericultural techniques and one of the major icons of a global technological culture of sericulture.

ICOMOS considers that this criterion has been justified.

Criterion (iv): *be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;*

This criterion is justified by the State Party on the grounds that the Tomioka mill and its related sites form an exceptional, complete example of an integrated ensemble for the mass production of raw silk, built at the end of the 19th and beginning of the 20th centuries. The series comprises a very large-scale, mechanised cocoon reeling and raw silk spinning mill, and three cocoon breeding and egg storage sites which are on a smaller scale but remain significant within an entire region

dedicated to silkworm farming. They clearly demonstrate the technological progression from the first imported Western machines through to the automatic reeling machine, as well as the progress made in silkworm selection, egg storage and cocoon raising techniques. These innovations played a central role in the development of the modern raw silk industry within a market that was globalised early on.

ICOMOS considers that the Tomioka mill and its related sites form an outstanding example of an integrated ensemble for the production of raw silk on a grand scale. The extent of the mill, from its initial design, and the deliberate adoption of the best Western techniques illustrate a decisive period for the spread of industrial methods to Japan and the Far East. Its large late 19th century buildings provide an eminent example of the emergence of a style of industrial architecture specific to Japan, combining foreign and local elements. Tomioka is testimony to Japan's early industrial success on the world stage in the area of raw silk.

ICOMOS considers that this criterion has been justified.

ICOMOS considers that the serial approach is justified by the complementarity of the sites presented, which illustrate the notion of an integrated technical system of production.

ICOMOS considers that the nominated property meets the conditions of integrity and authenticity and criteria (ii) and (iv).

Description of the attributes

- The Tomioka mill and its related sites form a complete example of the integrated production of raw silk, the production of eggs, their cold storage, silkworm farming in model sericulture schools, through to mechanised cocoon reeling and spinning of hanks of raw silk.
- Tomioka is an important testimony to the international exchange of the technologies of the industrial revolution in the second half of the 19th century. It is the first example of a mechanised factory using automatic machines and steam power in Japan.
- The Tomioka complex is testimony to a style of architecture combining foreign influences and local traditions, resulting in a style of industrial architecture specific to 19th century Japan that first appeared at this site.
- It is an example of the successful international transfer of technology that then spread rapidly in Japan, through the copying of the industrial tools and the transmission of the associated expertise. It contributed to the renewal of raw silk production and the development of a global silk market in the 20th century.

- Tomioka in its turn became an international exemplar and the symbol of the mechanised production of quality raw silk.
- Tomioka illustrates the shift from a state-run economic model towards private and cooperative management between small producers and large industrial groups.

4 Factors affecting the property

The urban growth of Tomioka, where the mill is located, could have a visual effect on the property. The 2002 renovation project was however extensively amended in 2006 to limit and better control this factor.

The number of tourists visiting the property is for the time being relatively small, only several hundred (S3 and S4) or a few thousand (S2) a year, with the exception of the Tomioka mill (S1) which attracts some 250,000 visitors all year round. The need for guides to interpret an agri-industrial property which is by nature not very easy to understand does however limit these numbers, as do the relatively small reception areas at the other mill sites. The main pressure would come from the need for parking.

The proximity to rivers could lead to erosion phenomena (S2 and S3) or flooding from violent storms and the potential increase in their strength due to ongoing climate change.

There is currently no atmospheric pollution, but an increase in acid rain could occur linked to climate change.

There is a risk of earthquake. However, the nominated sites have so far been spared any major damage, including during the recent 2011 earthquake. The damage that has occurred has always been limited and has been repaired appropriately. The risk to the property from a major earthquake is considered low.

There is also a risk of volcanic eruption. The sites would have been affected by ash fallout from the major 1793 eruption, but they were created after this event.

ICOMOS considers that the main threats to the property are urban growth in Tomioka and more generally natural risks (typhoons, earthquakes and volcanic eruptions).

5 Protection, conservation and management

Boundaries of the nominated property and buffer zone

The boundary of the Tomioka mill (S1) corresponds to the land boundaries of the historic mill, including the part used for the larvae production laboratory that no longer exists. The same applies to the Tajima Yahei (S2) and Takayama-sha (S3) sericulture schools and the Arafune cold storage site(S4).

For the first two sites, the environment is urban or peri-urban; for the third, it is a sparsely populated rural zone, and forest for the fourth. The buffer zones for the first three correspond to the limits of visibility from the sites and, vice-versa, visibility of the site from its surrounding environment. For the fourth, which is not very visible, the buffer zone takes into account the need to protect the natural conditions required to produce the cooling and its underground circulation through to the storage area.

Name and reference	Site surface area (ha)	Buffer zone surface area (ha)	Site inhabitants	Buffer zone inhabitants
S1: Tomioka	5.5	151.1	2	4,453
S2: Tajima Yahei	0.4	60.8	3	619
S3: Takayama-sha	0.8	54.1	0	53
S4: Arafune	0.5	148.6	0	11
Total	7.2 ha	414.6 ha	5	5,138

ICOMOS considers that the boundaries of the nominated property's sites and their buffer zones are adequate.

Ownership

Three of the sites are municipal property:

- S1, the Tomioka mill: city of Tomioka,
- S3, the Takayama-sha silkworm farm: city of Fujioka,
- S4, the Arafune cold storage: Shimonita municipality.

The Tajima Yahei (S2) silkworm farm is an inhabited private property.

Protection

Each of the sites is recognised as a historic site, under the protection of the Japanese *Law for the Protection of Cultural Properties*. The listings were made between 2005 (S1) and 2012 (S2). The main buildings are well protected as cultural properties of national importance.

The municipalities are legally responsible for applying protection for the sites. They act under the control of and support from the Council for Cultural Affairs, with national status and Prefectural representation.

The protection of the buffer zones is also under municipal responsibility, via the application of the *Planning Act* and the *Landscape Act*, or ordinances enforced by each of the municipalities. They are inscribed in municipal planning acts. Any construction is subject to prior authorisation and must comply with height and size regulations, and also comply with building directives concerning exterior appearance. The Tajima Yahei (S2) buffer zone also comes under the *Act on Establishment of Agricultural Promotion Areas* and the Arafune (S4) buffer zone comes under the *Forest Act*.

ICOMOS considers that the legal protection in place is adequate and effectively implemented.

Conservation

Extensive documentation is preserved at the Tomioka mill. There are other archival and documentation centres concerning the various sites in the municipalities and Gunma Prefecture: Gunma Prefectural Archives, Gunma Prefectural Museum of History, Sericulture Promotion Foundation, and Gunma Archaeological Research Foundation.

The current state of conservation of the serial property's various components is good for three of them (S1, S2 and S3); while the fourth, Arafune (S4) is the subject of a restoration campaign and a roof to protect the archaeological site is being considered. Also, work is scheduled for the Takayama-sha annex buildings. Each of the sites has its own conservation and management plan setting out the conservation measures. These plans are applied directly by the municipalities at three of the sites and under a partnership agreement with the private owner of Tajima Yahey for the fourth. They receive technical support from the Council for Cultural Affairs.

The municipalities are responsible for the conservation of the three sites they own, and for the privately-owned Tajima Yahey silkworm farm (S2) under an agreement between the owner and the city of Isesaki.

ICOMOS considers that the property's state of conservation is adequate overall and that the planned measures are efficient. However, ICOMOS recommends that further thought be given to the advantages and disadvantages of a protective roof at Arafune.

Management

Management structures and processes, including traditional management processes

The management framework grouping together the four organisations already in place for the conservation and management of each of the four sites is the *Coordinating Committee for the Tomioka Mill and Related Sites*. It is organised under the supervision of Gunma Prefecture and includes representatives of the municipalities of the various sites. It sets up cooperation between the personnel in charge of management, experts on the property, the local inhabitants and volunteer associations. The latter play an active role in welcoming visitors and bringing to life the properties, by organising demonstrations and experimental workshops open to the public. The property is also part of a wider network of knowledge about sericultural heritage and history in Gunma Prefecture, of which it is the jewel in its crown. Details about the Committee's composition and operation since spring 2012 were given in the documentation provided on 28 October 2013.

There is a natural risk prevention and disaster response plan in Gunma Prefecture. Within this context, the four municipalities have services organised to deal with these issues and response teams to handle fire, natural disasters and major risks for civil protection.

The cost of work carried out to research, conserve and promote the serial sites is between three and four million US dollars a year (2010-2012). Around 50% of this amount corresponds to research and conservation activities, around 30% for visitor facilities, and the remainder for day-to-day management and maintenance.

Around 20 conservation and management professionals work permanently at the various sites, of which half are at Tomioka. There are around 30 other staff members, guides in particular, at Tomioka; and 2 to 4 at the other sites. There are also various specialist services involved as required: the Agency for Cultural Affairs, various national cultural heritage organisations, etc. They are in charge of providing human resources to deal with the relevant technical issues that need addressing and provide regular training sessions for local stakeholders.

Policy framework: management plans and arrangements, including visitor management and presentation

In Japan, when a property is inscribed as a national cultural property, a conservation and management plan is demanded. It includes sections dealing with protection and conservation of the property, including a restoration and maintenance work programme, and a promotion and development plan including visitor facilities. This same planning situation therefore exists for the four nominated sites. Their combination provides the basis for a shared management plan insofar as works and maintenance projects are concerned. The drawing up of this plan implies harmonisation between the four sites that form the serial property.

Furthermore, individual conservation and promotion plans are compatible with a series of other prefectural or municipal plans, the main ones being:

- Gunma Prefecture Comprehensive Plan (2011-2015),
- Gunma Prefecture Basic Environment Plan (2011-2015),
- Gunma Prefecture Infrastructure Master Plan (2008-2017),
- Gunma Prefecture Infrastructure Master Plan, Kanra and Tomioka Regional (2008-2017),
- Policy for Improvement, Development and Conservation in the City Planning Area, Isesaki City Planning (2009-2015),
- Tomioka City Comprehensive Plan (2008-2015), and its City Planning Master Plan (2009-2028),
- Isesaki City Comprehensive Plan (2007-2014), and its City Planning Master Plan (2008-2027),
- Fujioka City Comprehensive Plan (2008-2017),
- Shimonita Town Comprehensive Plan (2007-2016).

Visitor management is generally constrained by the need for guided tours to help visitors understand this complex industrial property, of which each of the nominated sites forms a stage in the overall process of raw silk production.

Apart from the vast Tomioka mill, the other sites are relatively small and the number of visitors is as a consequence limited. Only the Tomioka mill is for the moment visited in any significant way. Tourist management plans are planned, in particular for adjacent car parking.

Involvement of local communities

The municipalities manage or contribute to the management of the four nominated sites; they are therefore directly concerned as the local political and administrative authorities. There are also several volunteer associations that directly involve the region's inhabitants in receiving visitors and promoting the sites and their cultural values.

ICOMOS considers that the property's management is effective, and that its Coordination Committee is in place. However, more thorough cooperation between the local structures and the Central Coordination Committee is recommended in order to harmonise the various provisions in the management plans for each of the sites and to arrive at a unified Management Plan.

6 Monitoring

A series of indicators has been defined to monitor the various aspects of the property's conservation:

- environment (acid rain, effects of climate change, influence of fauna and flora on the sites, state of conservation of the urban environment,
- natural disasters (rain and wind, erosion, earthquakes and volcanic activity, landscape impacts, effects of fire),
- impact of tourism and visitors on the sites and their environment,
- impact of public and private development projects,
- transmission of the property's values (conferences and seminars, participation of the sites in civic activities, and assessment of communications).

Monitoring using these indicators is performed by Gunma Prefecture or the municipalities, generally on an annual basis.

ICOMOS considers that the proposed monitoring is adequate.

7 Conclusions

ICOMOS recognises the Outstanding Universal Value of the Tomioka raw silk mill and its related sites. They bear witness to a crucial moment in the international spread of industrial techniques in the final third of the 19th century, from the Western world to Japan. They have their roots in ancient expertise that they renewed, whilst also becoming part of the global market of the period. It is the first large

industrial plant in Japan entirely dedicated to the mass production of an intermediate textile product: raw silk. In the early 20th century, the Tomioka integrated complex became in its turn a source of innovation and an international reference model for silkworm production, reeling and spinning of raw silk.

8 Recommendations

Recommendations with respect to inscription

ICOMOS recommends that the Tomioka Silk Mill and Related Sites, Japan, be inscribed on the World Heritage List on the basis of **criteria (ii) and (iv)**.

Recommended Statement of Outstanding Universal Value

Brief synthesis

The Tomioka Silk Mill dates from the early Meiji period. With its related sites including two sericulture schools and an egg storage site, it illustrates the desire of Japan, a traditional silk producer, to rapidly access the best mass production techniques. The Japanese government imported French machinery and industrial expertise to create an integrated system in Gunma Prefecture. It included egg production, silkworm farming and the construction of a large mechanised raw silk reeling and spinning plant. In turn, the Tomioka model complex and its related sites became a decisive component in the renewal of sericulture and the Japanese silk industry, in the last quarter of the 19th century, and a key element in Japan's entry into the modern industrialised world.

Criterion (ii): The Tomioka mill illustrates the early and entirely successful transfer of French industrial sericultural techniques to Japan. This technological transfer took place in the context of a long regional tradition of silkworm farming, which it profoundly renewed. In turn, Tomioka became a centre for technical improvements and a model that enshrined Japan's role in the global raw silk market at the beginning of the 20th century, and which bears witness to the early advent of a shared international culture of sericulture.

Criterion (iv): Tomioka and its related sites form an outstanding example of an integrated ensemble for the mass production of raw silk. The extent of the plant, from its initial design, and the deliberate adoption of the best Western techniques illustrate a decisive period for the spread of industrial methods to Japan and the Far East. Its large, late 19th century buildings provide an eminent example of the emergence of a style of industrial architecture specific to Japan, combining foreign and local elements.

Integrity

The integrity of the serial property's composition is good, illustrating the idea of a productive complex for an intermediate textile product: raw silk. The structural and functional integrity of each of the components is more

uneven and at times difficult for the visitor to understand, notably the Takayama-sha sericulture school and Arafune cold storage. The landscape integrity, as it relates to the buffer zones, requires particular attention.

Authenticity

The authenticity of the components presented is generally satisfactory in terms of its various dimensions of structure, form and materials. The perceived authenticity is remarkable at the Tomioka mill, which has retained its complete textile machinery. The restoration activities at the Arafune site must remain within a strictly controlled framework in terms of its authenticity, which must remain archaeological in nature.

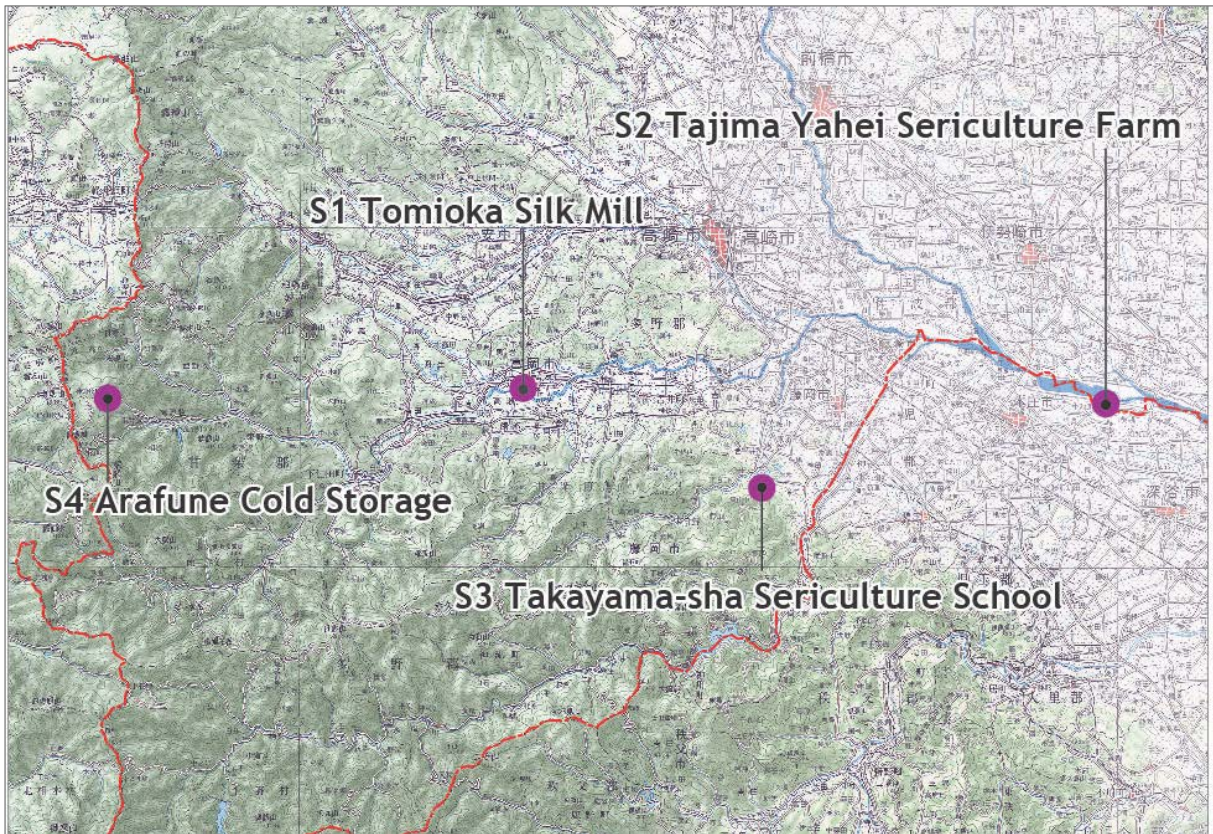
Management and protection requirements

Each of the four sites comprising the serial property is protected by Japan's *Law for the Protection of Cultural Properties*. The main buildings are also protected as cultural properties of national importance. Under the application of this law, each of the sites is covered by a conservation and management plan already in place under the aegis of the cities and municipalities, including in the case of the privately owned Tajima Yahei (S2). Continuing this protection policy, the buffer zones correspond with a desire to control the urban and natural environments using measures that are, in theory, stringent. The management system relies on the competent services of the municipalities, the Commission for Cultural Affairs of the Gunma Prefecture and a series of scientific institutions involved in the regional silk heritage, and volunteer associations. The Coordination Committee, established in spring 2012, is an overarching body responsible for coordinating the actual operation.

Additional recommendations

ICOMOS further recommends that the State Party give consideration to the following:

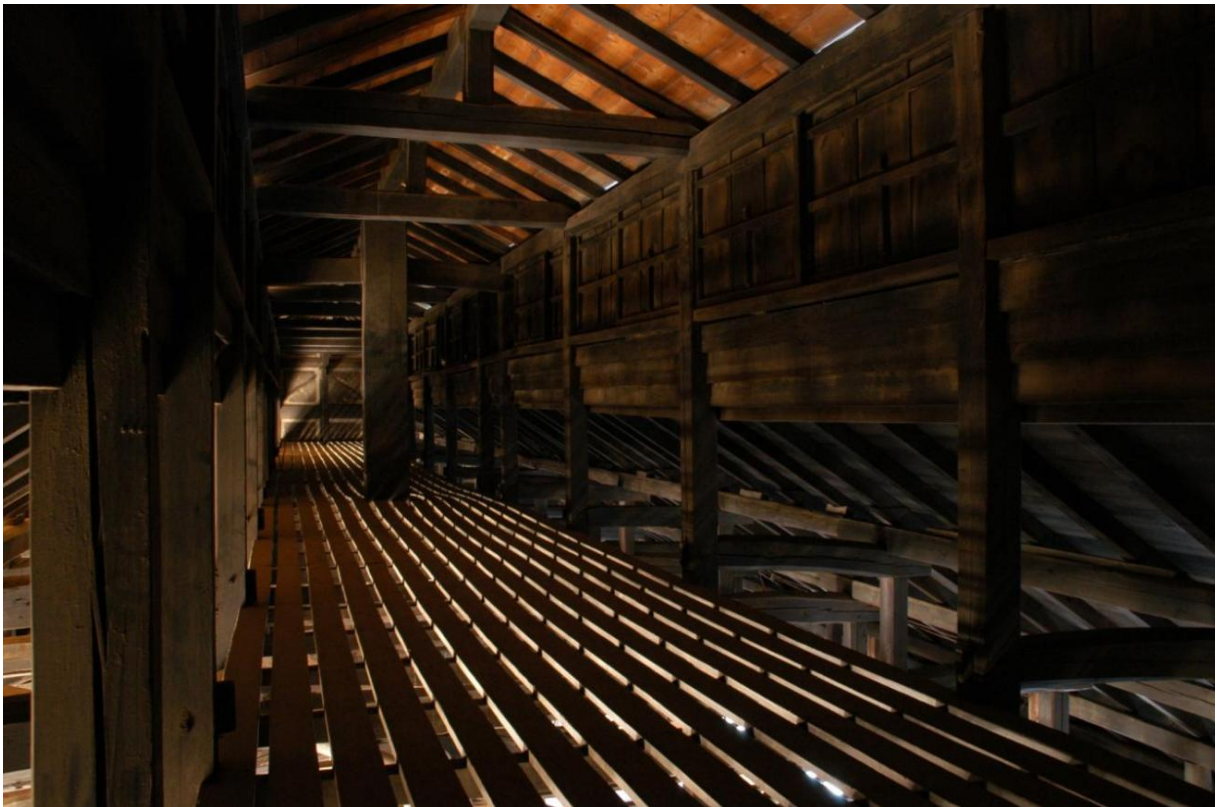
- Continuing to pay close attention to economic and urban development in the vicinity of the sites by strictly applying the planned protection measures for the buffer zones, and even consider strengthening them;
- Giving deeper consideration to the archaeological nature of the Arafune site and the advantages and disadvantages of a protective roof;
- Strengthening the cooperation between the local structures and the Central Coordination Committee in order to harmonise the various provisions in the management plans for each of the sites and to arrive at a unified Management Plan;
- Undertaking research on the transmission of expertise by women, from France and within Japan itself, thanks to their roles as instructors and workers; and improve knowledge about the latter's working and social conditions.



Map showing the location of the nominated properties



Tomioka raw silk mill



Tajima Yahei sericulture farm



Takayama-sha sericulture school



Arafune cold storage site

