Windows to the Universe and potential criteria in the World Heritage Convention context

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What follows is conceived as a systemic approach linking the idea of 'Windows to the Universe' to the recommended use of current World Heritage concepts such as 'Outstanding Universal Value' (OUV), criteria expressing it, integrity and authenticity, etc. These concepts are defined and regularly updated by the World Heritage Committee and publically expressed through the *Guidelines for the implementation of the World Heritage Convention*[1]. This is very useful for preparing a World Heritage dossier, which must strictly follow the nomination format; moreover it also offers an efficient and global methodology for every place playing the role of a 'Window to the Universe' with diverse associated values. Practically it relies upon the author's experience of the nomination evaluation as carried out by the ICOMOS[2] organization for the World Heritage Committee annual sessions.

To be listed as World Heritage Site with a well-fitted OUV requires a strict analysis of the place: first building a credible dossier, second being accepted by the advisory bodies in charge of the implementation of the WH Convention[3]. We propose here a conceptual approach combining the two fields so as to develop a credible demonstration of the OUV for a 'Window to the Universe' place and to choose adapted WH criteria. We recall that there are 10 official criteria to express the potential OUV of a given place, 6 for cultural attributes and 4 for natural ones (see Table 1.1).

Basic features

We can represent the 'Windows to the Universe' concept schematically using three main tangible elements briefly defined here but easily identified by everyone.

The first is the sky itself in the broadest sense, in other words the physical universe comprising stars, planets, galaxies, dark matter, etc. The second is the idea of a 'window', which means basically a frame and a pane of glass. In this sense, the frame of the window represents the local place with its environmental features, and the glass in the window represents the atmosphere through which we have to observe the sky. The third element is the human eye together with the optical instruments or other artefacts that can amplify its observational capabilities. Links with the human brain must also be mentioned here, as they are responsible for rational knowledge (science) and social representations (beliefs, religions, etc.) and uses (practical applications of astronomy to architecture and urbanism).

Of course these three basic issues of sky observation are intimately related to one another. But they are not of the same nature, generally speaking, nor are they directly related to the WH Convention concept of inscription of a given property. What is the most spontaneously adapted to the WH Convention goal is the place itself, as a local tangible property. We can define it by its physical boundaries; we can identify the owner, the manager and we can make an inventory of its tangible evidence and of its specific environmental qualities (e.g. atmosphere qualities that frequently determine the observation position itself).

The presence of the human observers and astronomers of course gives meaning and life to the place, bearing important additional intangible value through the history of knowledge

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1 UNESCO World Heritage Centre, Paris, latest edition 2013.

2 The International Council of Monuments and Sites.

3 ICOMOS for the cultural value and the International Union for the Conservation of Nature (IUCN) for the natural value.

and representation related to it. Observers alone don't make sense in the way of the WH Convention (it is not the Nobel List!).

Can 'Dark Sky' alone be taken into consideration?

The sky is obviously the goal of the observation from the site, and every device and artefact of the observatory is made for that. But the sky itself cannot be defined as a given site, and not at all as belonging to a State party! These are clear requirements for a WH Listing: place of the property, owners, State party responsible, etc. It is not a place in a juridical sense, or even a part of a place. The difficulty of recognizing the sky itself clearly occurred there: it is impossible to define it in WH Convention terms. It can be considered as environmental quality of a place through its exceptional visibility; but it can't be considered as a fully delimited place having OUV by itself.

Of course, the sky must be considered as a major natural feature of the terrestrial environment; but would seem a bit strange to give an 'OUV' to the Universe; in other words to associate a human label of universality to the Universe! This is clearly a paradox. In philosophical terms, it opens questions dealing directly with an anthropocentric approach to the Universe. In such a case, this would mean that humankind allows itself to give a human recognition and value to its global astrophysical environment. In doing so, it would join antique cosmologies and medieval descriptions of the Earth as the Centre of the Universe, and humankind with its gods as ruler of the Universe. It is precisely contemporary astrophysics that shows us the tiny place that humankind actually occupies within the Universe, so that to give human value to the Sky, let alone 'OUV', seems really nonsensical.

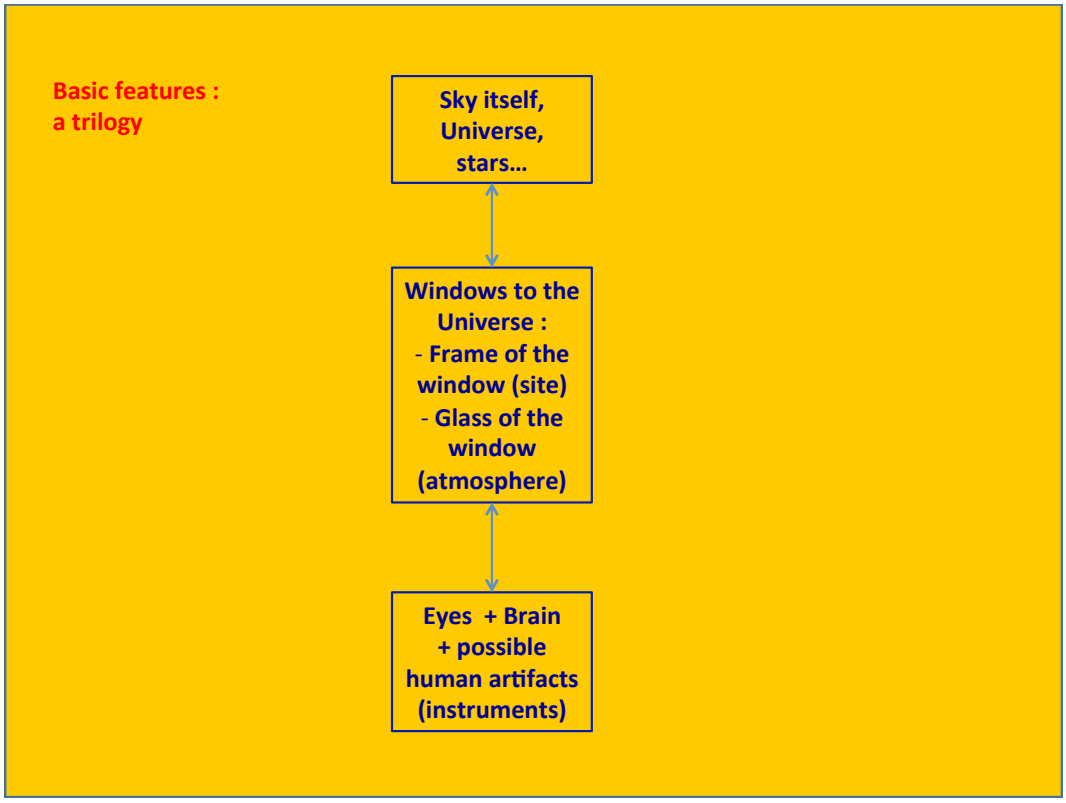

Fig. 2.1. Basic features shaping the 'Windows to the Universe' concept are: Sky itself (object of the observation), Site as a property in local permanent context (geography, atmosphere, architecture, landscape, nature…) and Humankind using the observation place eventually with artefacts/instruments.

If all this seems too theoretical, we can ask practical questions dealing directly with the *Operational guidelines* for the management of WH places: What is the owner of the Sky? What is the management policy to conserve the OUV of the Universe? Obviously, there is no answer to these questions and, even more absolutely, no meaning. That underlines the nonsense of the OUV concept applied to Universe. The Universe or any component of the Sky cannot be nominated in itself. In heritage terms, the Universe is only an element of the landscape we can observe from a given place on the Earth. Consequently, we can only talk about relationships we have with the Universe and not of the Universe itself as a human property.

In WH Convention terms, this leads us back to the site, to the 'frame of the window', and to study its attributes and qualities as a cluster of local elements for a possible nomination. Clearly a Dark Sky alone does not meet the WH requirements. But it could be an essential attribute among others supporting the exceptionality of a place.

Natural and cultural attributes of a given place

We understand that the 'frame of the window' means, firstly, the physical environmental features we have locally, as tangible attributes supporting or surrounding the human observation of the sky at a given place. So, the Window frame presents a series of physical attributes constituting the originality of the site, with consequences for its natural meanings as well as for featuring the landscape. All these attributes indicate the natural and physical originality of the place. In this way it has natural value, in the sense given to this term in the WH Convention. The assessment of local natural value may be done prior to others, by the classical evaluation of natural attributes trough scientific methodology. Relationship with the sky could be handled in this sense and the quality of the sky view 'through the window' appears as one of the landscape and/or major natural attributes of the place. These local natural attributes always exist for a given place, independently of its value and possible OUV, i.e., the top-quality recognition at the higher international level.

A 'Windows to the Universe' site could also carry important cultural evidence related to human observation of the sky. For example, it could be a monument of observation (observatory), some archaeological remains (archaeoastronomical site), architectural features or urban patterns, or a cultural landscape from an ancient civilization that was directly linked with the observation of the sky from the place. These local attributes do not exist systematically, and a site could be exclusively natural. In that sense, cultural attributes are additional to the natural layout of the place. Accordingly, they appear as second issue in the study of its attributes. They could be tangible attributes or intangible ones, conveying the human value associated with a given place. Such intangible additional value could be scientific but not necessary, as we have seen in the first Thematic Study[4].

In every case, the combination of natural and cultural attributes offers a specific landscape; we can easily recognize it for modern observatories in context, and that could be a mixture between cultural and natural attributes.

Dark sky quality as a local environmental attribute

After the frame, the second element of the 'window' is the glass, in other terms the atmosphere. It is an obvious intermediate physical matter between the human eye and the sky, with transparency properties. Dark-sky quality mainly results from the local quality of the atmosphere. In this sense, it is one of the physical attributes giving a specific value to the place,

[4] *Heritage Sites of Astronomy and Archaeoastronomy in the context of the UNESCO World Heritage Convention*, (ICOMOS & IAU) edited by Clive Ruggles and Michel Cotte. E-book 2010; printed edition 2011.

or its eventual lack of value in the case of light pollution. The quality of the atmospheric transparency depends firstly upon the location of the site with its geographical and climatic dimensions. It is also a variable parameter, given variable cloud-cover, variable moonlight depending upon the phase of the moon, or other typical natural factors. The need for a global and scientific description of these features joins the need for attribute description in the WH dossier sense.

Transparency is an objective physical datum for the atmospheric description of a given place, and can be determined scientifically by means of instruments and regular observations (wetness, density of microscopic dust, turbulence, day-by-day diaries and statistics of the atmosphere, etc.). These experimental results can be compared from one place to another so that the objective quality of a given place can be established with certainty. Of course, some sites are more favoured by nature than others and the objective natural value of such places may be established. Indeed, astronomers have done this for a long time and we have a history of astronomical sites dealing directly with the quality of the local atmosphere and its changes with the rise of urban development and artificial light ever since the 'industrial revolution'. This kind of attribute measurement is typical for the natural description of a given place, even when it is threatened by human lighting factors such as pollution by dust and fog. This human stress upon the natural pattern is not specific to atmosphere transparency, and it is an issue among others as regards human threats upon nature.

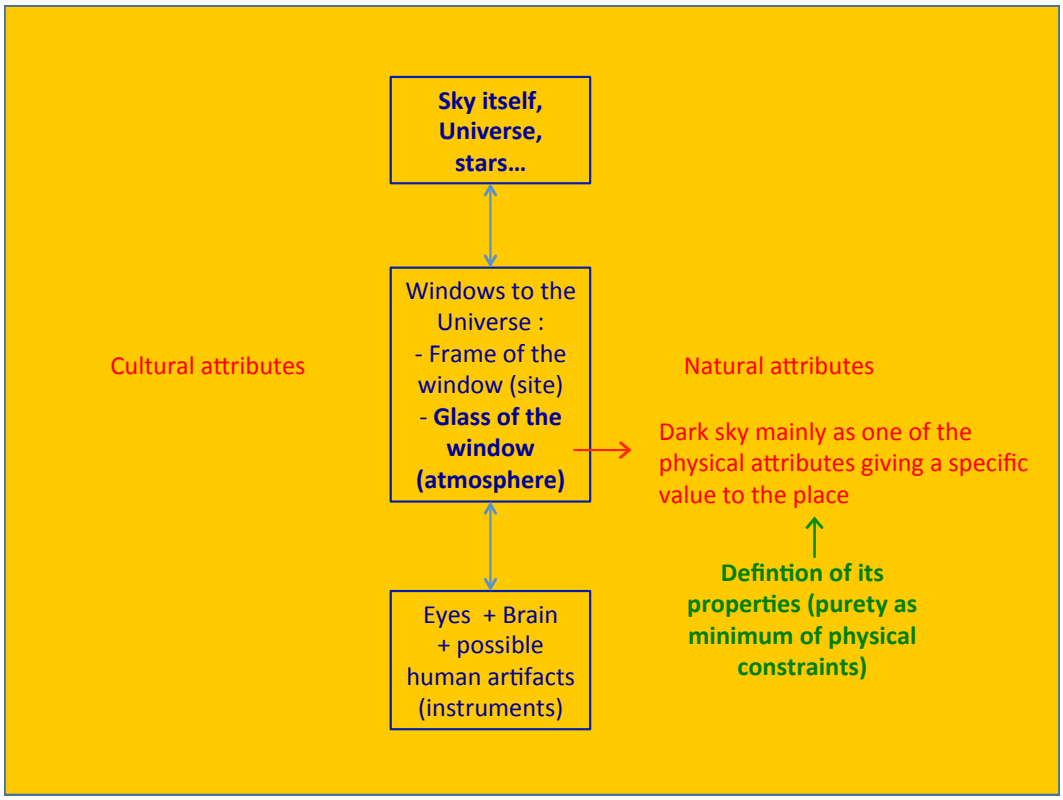

Fig. 2.2. Generally speaking, a given place has natural attributes and cultural attributes; clearly intrinsic Dark Sky quality is a natural attribute of the place among others.

Dark sky as management of Nature

The conservation of dark sky qualities for a given place is a relatively recent initiative but with some important successes as underlined by the international 'Dark Sky Reserve' awards. It remains permanently a challenging goal related to the control of light pollution, which needs strong collective concerns both for local communities' councils and for the inhabitants of a significant geographical area. For instance, it can be important to maintain good conditions for astronomical observations or for improving the quality of the night-and-day cycle for the conservation of natural living species in danger.

The maintenance of dark sky quality can be a strong management issue in itself for an astronomical site. It is necessary in order to maintain good conditions for doing the science and/or for a more natural night environment.

As a cultural attribute it mainly concerns the history of the observatory site as a scientific establishment. The other Dark Sky value relates to the conservation of nature and the establishment of human rights to access the visibility of the natural night sky. These points are important, but recent, and could be not considered as a cultural heritage attribute of the place, only as natural features. They could be seen as issuing from a recent, modern trend of environmental sensibility—a typical feature of today's social movement for political and scientific ecology aiming to defend the conservation of natural value versus uncontrolled human economic and urban development.

The best way to promote Dark Sky initiatives today in relation to the WH Convention is probably not to try to get OUV recognition for this natural feature, but to demonstrate that it could be an efficient and durable way of managing Nature. In that case it is a well-managed environmental quality of the 'window glass', within the specific efforts of local communities and site managers. It is a quality among others that allows a good expression of all the attributes together, especially a global landscape associating features on the earth and in the sky. In the case of observatories, the surest sign of maintaining the dark sky value is the permanence of important scientific programmes of observation. This global landscape expression of an ensemble of attributes supports what we call 'integrity' and 'authenticity' factors of the site. The concept of integrity expresses the completeness of different attributes constituting the value of the place and the easy expression of their relationships. Authenticity expresses the conservation of design, structures, appearance and function of the place.

Today, we can examine the possibility that there is a lack of glass in the window; this definitively bypasses problems due to the atmospheric filter! In this sense, the satellite telescope Hubble is evidence of human progress in the observation of the sky. It represents a crucial and final stage in the story of the location of observatories, moving beyond efforts to build them in mountain locations with the most favourable dark sky conditions throughout the year. In this sense, the Hubble space telescope has an exceptional value, but the question of its examination in a WH context remains a complex one because of its location and its status as a moveable instrument in the sky. The intrinsic scientific value of the Hubble telescope and its family of similar observatories in future is really outstanding.

Dark Sky among a cluster of natural attributes

Globally speaking, if we return first to the natural dimension of the 'Windows to the Universe', Dark Sky quality contributes to the global natural context of a given place. It belongs to a larger group of natural attributes of the site, forming its natural environment components. Of course, these natural attributes could have exceptional value together, and this way examining the combination of a group of natural attributes must be seriously considered through the concept of 'Natural Starlight Reserves'. Thus, the value of a given 'Window to the Universe' place in a global natural sense is a possible way to define potential OUV. That interweaves exceptional

dark sky properties with other exceptional or unique natural attributes of the place, forming for instance an outstanding 'monument of nature'.

Note that the dark sky alone as a natural attribute remains problematic, because it could not be seriously attributed just to one given place, or even to a limited series only relying upon dark-sky quality, without controversy. Furthermore, that isolated attribute suggests a global sky value not really linked with a given place, except is so far as we can do a comparative demonstration showing that it is absolutely better than others. On the other hand, a complete lack of other attributes drastically reduces the credibility of OUV justification because it will rely upon too narrow a base and it will appear as not really supported by a clearly identified site. It will be seen as a theoretical concept out of any context.

Clearly, whether or not the starlight of a given place has exceptional quality, it constitutes one of the natural attributes forming its global value. In this case, the quality of the window glass significantly reinforces the natural qualities of the window frame. It bears one specific attribute among other remarkable natural ones. Dark-sky quality contributes to the global natural exceptionality of the place, both as a natural site and as a "window to the Universe", and it contributes to its beauty as well as for its intrinsic scientific properties favourable for professional or amateur views of the Universe. In that way, one or some of the natural WH criteria could be appropriate for supporting possible OUV. If a group of natural attributes for a given place may be described with possible OUV, natural WH criteria must be examined, especially criterion (vii) for OUV as a "monument of nature". Contrariwise, if the only attribute reaching the top level is the quality of the dark sky, then that is problematic. A dark-sky attribute for a site, alone, without any other natural or cultural attribute at OUV level, encounters the strong reservations we have presented above for the sky and the Universe, which could not be presented in OUV terms.

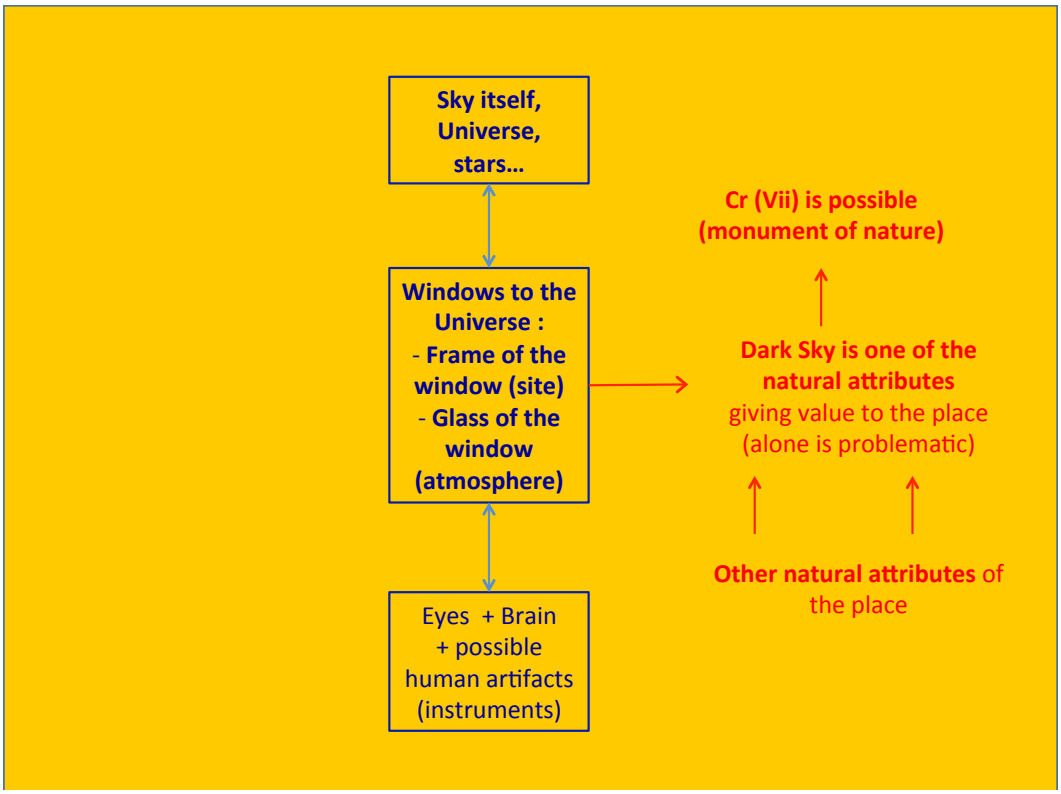

Fig. 2.3. One of the best ways to use 'Dark Sky' value is among a set of other natural attributes, making a generally remarkable landscape during both night and day; potential OUV results from the combination of attributes.

For instance the World Heritage List, since 1990, already includes the *Te Wahipounamu – South West New Zealand* natural zone. Its OUV declaration mentions a large and diversified set of natural attributes expressing many natural dimensions, which is recognized by the use of four natural criteria mentioned by the *Operational Guidelines*—(vii), (viii), (ix) and (x):

(vii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance;

(viii) be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;

(ix) be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals;

(x) contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation."[5]

Such diversity for one given place is exceptional.

The brief description of the site and the text justify the criteria: they accurately describe the remarkable diversity of mountain landscapes, natural features for geology, biodiversity, etc. However, they do not mention dark-sky quality. Yet in the adjacent District of Mackenzie and Tekapo Lake in the north-eastern part of the natural park, we can observe the sky with exceptional visual atmospheric quality. The district offers today one of the world's most highly rated Dark Sky Reserves. The district is under collective rules that strictly control all artificial lighting, in a durable perspective and giving an absolute priority to dark-sky conservation. For us, it makes sense to propose an extension of the already listed mountain park to the Mackenzie District and Tekapo Lake, with the addition of Dark Sky value to the others, e.g. to reinforce criterion (vii) ('monument of nature').

Fig. 2.4. Tekapo Lake at night. ©TWAN, http://www.terrastro.com/galleries/lake-tekapo/

[5] World Heritage Center, *op. cit.*, 2013.

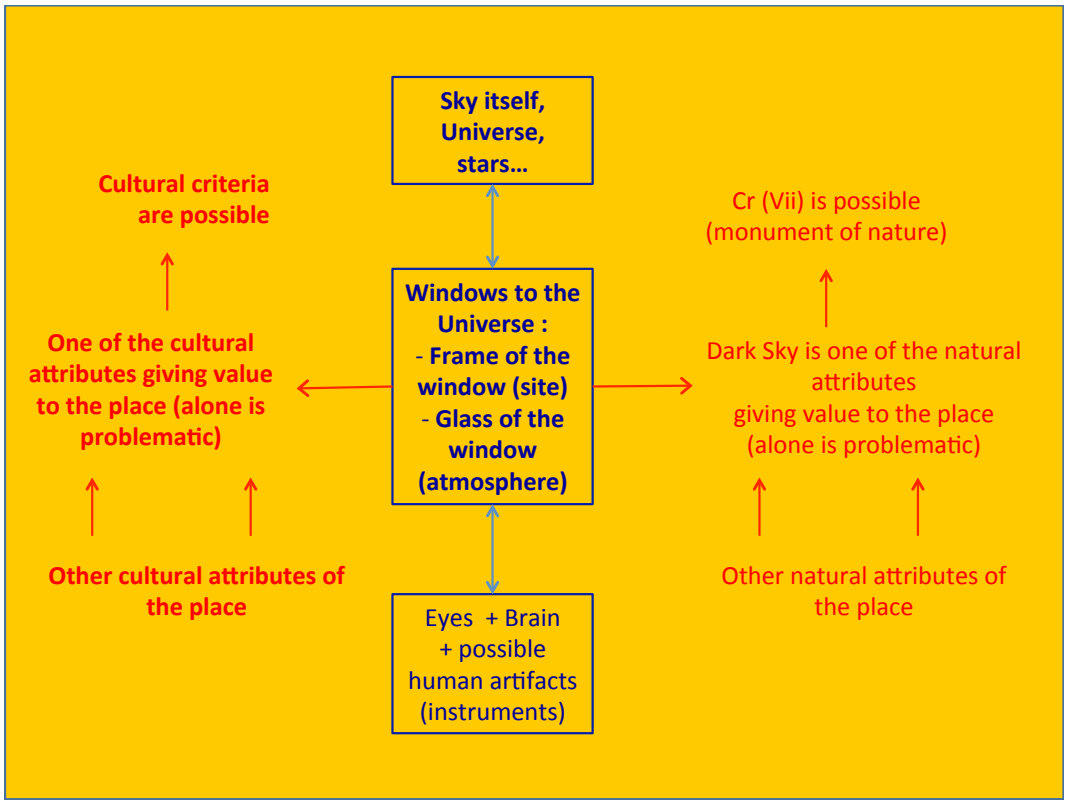

Fig. 2.5. The other good way to use 'Dark Sky' value is to link it to a set of remarkable cultural attributes, or—equally often—to a mixture of cultural and natural features.

Dark Sky among a cluster of cultural attributes or mixed attributes

In a similar way, dark-sky quality could be considered as a cultural attribute in the context of the history of the observatory place. In other words, a remarkable starlight property for a given 'Window to the Universe' could strongly reinforce the value of the observatory site and explain its implementation and its scientific history. Similar remarks about the exceptional quality of the cultural attributes must be made if there is an expectation to reach the level of demonstrating OUV: alone, dark-sky quality remains problematic and will appear out of any context (which is the exact opposite of cultural significance!).

However, dark-sky value associated with a series of other cultural attributes could produce strong global significance and meet possible OUV. Such global value could be expressed by one or more of the different cultural criteria, (i) to (vi). We have to discuss that choice in the context of the site in question and in a comparative view with other similar sites in the World.

We also have to remember that, in any case, Dark Sky forms a management issue. This means that we have to pay great attention to the preservation and conservation of the darkness of a place, through regulation and a collective attitude inside the buffer zone—a strongly recommended management issue. But we have to avoid confusing a possible attribute supporting OUV (exceptional quality of Dark Sky at a given place) with the good environmental management of light pollution (Buffer zone, lightning regulation…). Indeed, this is a mistake frequently made when studying a place without a sufficient attention to what constitutes a heritage site, especially in the WH context.

In the context of the High Mountain Observatories serial nomination project, the case of Pic du Midi in front of the Pyrenean Mountains (France) offers a remarkable example of

combined attributes, both cultural and natural. Among them, atmosphere quality plays a significant role because of its stability and its clarity due both to the altitude (2877 m) and the isolated position of the Pic. In historical terms, it is one of the pioneering high-mountain observatories in the World (end of 19th Century) and probably the oldest of this type to be continuously used up until today. It offers by its artificial shaping at the top of the Pic a really impressive view and can be seen from very far distances from a great part of the surrounding valleys, out to cities like Toulouse when the weather is clear. It forms one of the strongest images of the regional identity of Languedoc. On the natural side, the remarkable geology of the Pic contributes to thermal properties that are linked with the stability of the local atmosphere. But what is probably the most impressive is the panorama it offers, as a Northern belvedere, of the central part of the Pyrenean chain, due to its isolated position. The landscape view on the mountain skyline is exceptionally wide owing to the purity of the atmosphere in a place where sunny days are the most numerous in Europe. In short, Dark Sky and landscape qualities are intimately associated[6].

Fig. 2.6. Pic-du-Midi Observatory, France, offers a remarkable combination of cultural value (more than one century of continuous high mountain observation of the sky), identity landmark (one of the strongest and the most visible symbol of the Languedoc region), natural value among them quality of atmosphere and Dark Sky, and the ensemble offering an outstanding mountain landscape. © Courtesy of Régie du Pic-du-Midi, 2009.

[6] See Chapter 9.

Conclusion

To conclude, the Dark Sky by itself is, of course, an important natural feature for a given place, especially in the context of astronomical observations. It can be studied in scientific terms aiming to describe the local atmospheric properties (clarity, stability, average of sunny days, etc.). We have to note that such qualities do not only allow the exceptionality of the dark sky, but also the quality of the landscape by day. Nonetheless, it is really challenging to try to use dark-sky quality alone as an 'exceptional natural attribute supporting potential OUV'. This is firstly because it emphasizes the sky itself more than the local context, and the sky itself cannot be considered in the scope of the WH Convention, as we have seen, because it is not a 'property' in the juridical sense, with mapped limits, an owner and conservation policy, etc.

We absolutely need to place the Dark Sky in context. This means that we need to consider other natural or cultural attributes of the given place, i.e. the completion and correlation of diverse attributes that (generally speaking) make complete sense for the site, with important mutual reinforcement of meanings and global value.

In cultural terms, Dark Sky quality supports one of the fundamental and permanent patterns of the Heritage of astronomy and archaeoastronomy. By itself, it forms the basic and initial condition for choosing a sky observation site. In some way, the other tangible attributes result from it, as a subsidiary human development with its fixed or moveable instruments, its architecture, for the history and socio-anthropology of the place, etc. In other words, it defines a basic requirement for launching human activities in a diversified sense: not only sky observation for knowledge purposes, but also for human and social representation, symbolic and religious issues, and applied astronomy to time measurement, architecture and urbanism, individual and collective prediction of future, navigation, etc. It supports and recalls to us the history of exceptional observations, precious records and of some major scientific discoveries. It also informs us of the history of its initial settlement and scientific developments. Astronomical and archaeoastronomical heritage is a subject by itself, notably explored by the first ICOMOS–IAU Thematic Study with its 18 chapters covering both long historical times from prehistory to present and every large civilization area in the World[7]. In every civilization, all people have a vision of the sky and a cosmology.

Another important issue must be taken into account with the regulation of light pollution aiming to preserve Dark Sky quality. In this sense, Dark-Sky Reserves with specific regulations adopted by local communities to regulate and control lighting, both public and private, are really important. This promotes durable development that respects nature and offers human and social value by itself. In WH terms it is clearly a 'management issue'—a really virtuous one—and it could easily be added to other ways of respecting nature and for a conservation policy of the local cultural components. It could be an important part of the cultural landscape conservation plan or/and an issue for the buffer zone regulation, thus wider than merely 'astronomical or archaeoastronomical places'. In any case, the Dark Sky approach offers us a long-term preservation policy and a basic management issue for the place.

In any case—natural, cultural or mixed—the quality of the local 'Window to the Universe' presents a basic attribute among a set of attributes and a virtuous management issue. This could support potential OUV in the WH sense as well as supporting a regional or national value of a given place. It is also very important to share that group of values with inhabitants and visitors by way of valorization plans, especially for young people.

[7] Clive Ruggles & Michel Cotte, *op. cit.,* 2010 and 2011.