

## THE ROLE OF SPATIAL LAYOUT OF HOSPITAL PUBLIC SPACES IN INFORMAL PATIENT-MEDICAL STAFF INTERFACE

025

**Nicoletta Setola**

University of Florence / e-mail : nicoletta.setola@unifi.it

**Sabrina Borgianni**

University of Florence / e-mail : sabrina.borgianni@unifi.it

**Max Martinez**

Space Syntax Limited / e-mail : m.martinez@spacesyntax.com

**Eime Tobarì**

Space Syntax Limited / e-mail : e.tobarì@spacesyntax.com

### Abstract

*In the contemporary society hospital is not only called to assure quality of care, but it have to answer to new social needs to provide citizens' health rights. Right to health, in a broad sense, include social rights, as well as more basic civil rights. These social rights respond to social needs such as easy access to care to all, promotion of the social respect culture and attention to doctors-patients relation and to relations involving caregivers-doctors-patients. Hospitals, in order to ensure the Right to health, should open ever more to the values of the community and to these new social needs. For this reason today the spaces in the hospital that we define 'public', such as spaces of interface, welcoming, waiting, relations among people have assumed a particular meaning.*

*What this paper presents is part of a interdisciplinary research on health rights and hospital design. A study was conducted in three hospitals in Tuscany region in Italy by a group of researchers, including lawyers, architects, sociologists, health managers, doctors and other medical staff, in an attempt to reach a greater level of knowledge of what may be the spatial factors that affect the enjoyment of Right to health. The final scope of the research is to propose guidelines for health policy makers and new spatial indicators for the hospital design.*

*The whole study is constructed around the legal perspective that is focused on the Right to health as a social right based on relationships. For this reason this study focuses on how spatial configuration and other environmental factors can facilitate or undermine those relations that represent an added value and contribute to fulfil the Right to health.*

*This paper demonstrates how spatial configuration, of public spaces within hospitals, especially the integration core, influences relationships and interfaces between different categories of people. The paper particularly focuses on relationships between patients and medical staff, which was identified as a key element in order to achieve a better quality of relations, and therefore an effective enjoyment of Right to health.*

*Social surveys and space syntax analyses (convaxial technique) were used to investigate the relationships between spatial layout and people interactions.*

*The results here illustrated concern the building scale. We found some spatial-configurational elements which affect the patient-doctor informal interaction and can give us information about how and where these interactions can occur. Particularly the integration core of the 'public' and 'staff' models, the horizontal linkages between the cores and the functions of space.*

*The meaningful contribution of this paper is to demonstrate how configurational structure of public spaces in hospital can affect and transform, in different way, the quality of relations*

*between patients and medical staff and therefore the fulfilment of Right to health, since it can provide decision-making processes with a more comprehensive vision of the existing problems and possible prospects. Moreover the research highlights the importance of an interdisciplinary, holistic approach to the issues of health rights and hospital design.*

**Keywords:** *Configurational analysis, Hospital public spaces, Right to health, Patients interactions*

**Theme:** *Building morphology and performativity*

## 1. Background

This paper shows part of results of SPACES, an ongoing Italian interdisciplinary research that involves architects, lawyers, sociologists, health managers, doctors and other medical staff. This research focuses on Right to health and hospital design. The study was conducted in three hospitals in Tuscan region in Italy with the final scope to propose guidelines for health policy makers and new indicators for the hospital design.

In the contemporary society hospital is not only called to assure quality of care in order to remove or reduce a condition of disease. Hospitals also assume new missions in order to answer citizens' social needs related to Right to health, such as self determination, access to information, privacy, solidarity, relations among doctors-patients, and relations involving relatives-doctors-patients (WHO, 2008).

Right to health belongs to social rights. The full satisfaction of social rights does not depend solely on the distribution of single state benefits, but on social life as it happens in places such as the built environment and in buildings. Therefore social rights require the existence of social links - as family, school, working environment, social and personal life environment - in which and through which everybody becomes a person and is able to express him/herself as such (Longo, 2012).

Space is essential for the meaning of social rights: it is more properly the place where these rights are exercised, and not the practical result of politics. Space is not only the physic place where relations of social life happen, but also it has an important effect on preserve or eliminate these relations. So the social dimension of space is a pivot to discovering a new dimension of social rights. In particular space configuration is the aspect that mainly affects relations among people.

The research combines the configurational analysis with the study of social patterns to understand how spatial configuration can facilitate or undermine those relations that represent an added value and contribute to fulfil Right to health as one of social rights.

The research focused on the study of public spaces in hospital because in that spaces actions and interactions essential to fulfill Right to health happen, both before and after the performance delivery.

The meaning of public spaces in hospitals has to do with the role of the hospital within cities and territory, and the role of the hospital as service for the community and humanization of care (Gesler et al., 2004). The modern vision of the hospital is focused on the concept of 'hospital as civic architecture' (Curtis et al., 2009): it has to open to the concept of solidarity and belonging to the community with spaces dedicated to social and cultural activities. The term 'public spaces' once was referred to the entrance and connection area before hospital functions, but now this term has a wider meaning. The hospital public spaces are the places dedicated to new social needs concerning with information, communication, relations and rest. These spaces are the most important spaces to facilitate interactions among different users. These spaces can support a positive or a negative patient experience in relation to physical environment and to its spatial characteristics.



Figure 1 Photos of the public spaces in the three case studies in Tuscany

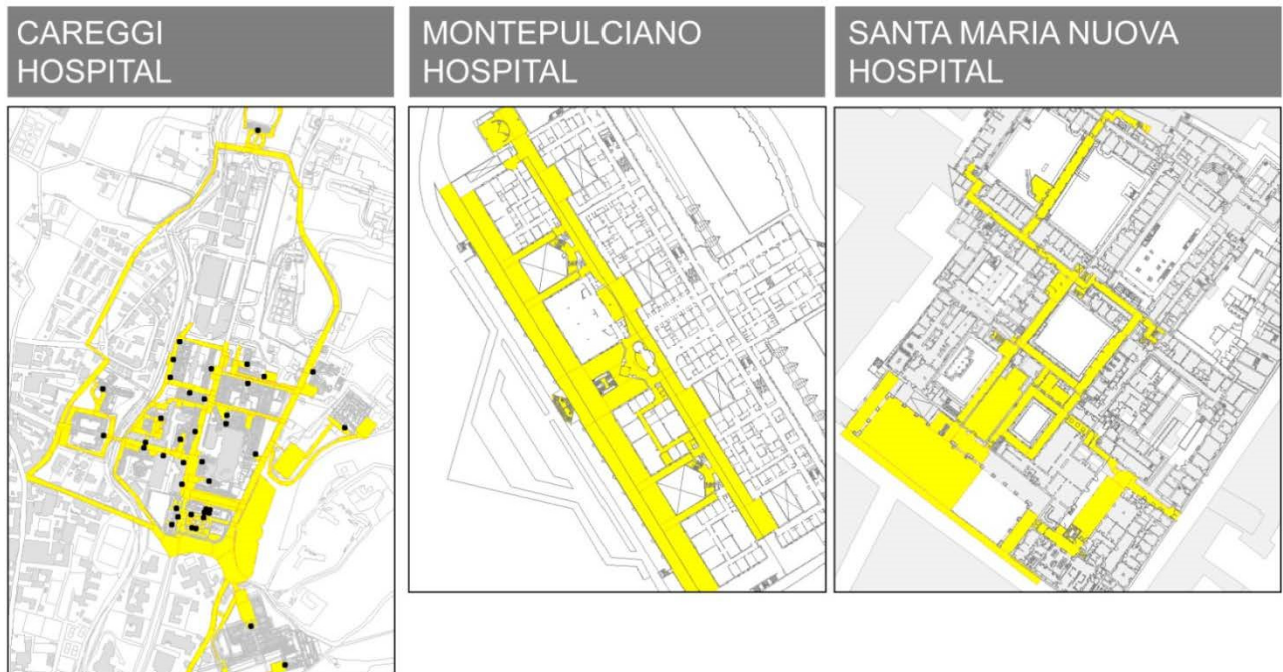


Figure 2 Maps of public spaces in the case studies

This paper presents only a part of results of the whole research and focus on the role of hospital layout in the relationships between patient and medical staff. The paper shows the evidence on how space creates and controls interfaces among different users in hospital public spaces. It demonstrates how spatial configuration of public spaces within hospital, especially the integration core, influences relationships and interfaces between different categories of people. This interface is a key factor for the vision of health rights as a social right based on relationship among different users. Particularly it focuses on relationships between patients and medical staff, which were identified as a key element for a better quality of relations, and therefore for an effective enjoyment of Right to health.

### **1.1 Patients-medical staff interface**

For the new vision of right to health as right based on relationship among different users, there is one relation that has a particular meaning: that between patient and medical staff (P-M). It has been identified as a key element, because it contributes to build the identity of hospital and could foster patients' perception of taking charge. Relations materialize through interactions, for this reason we chose to investigate interactions between patient and medical staff.

To investigate this phenomenon by the spatial point of view it needs to detect these (P-M) relations: where do they happen? Which kind of interactions are they? How many interactions are there? To investigate the qualitative aspect of these interactions we have to introduce the concept of interface, that is a spatial relation between or among two broad categories of persons (Hillier, 2007). Therefore the specific research questions are: which form of interfaces does it happen between patient and medical staff in public spaces? We know that there are contacts, moment and actions and they are essential to the relation that satisfies the right, but which kind of contacts are they? And how spatial layout affects them?

## **2. Approach and Methodology**

The general approach to investigate in which way the space affects the patient experience in terms of relations in public spaces within hospitals, is based on direct analysis of case studies. We chose to investigate the spatial configuration as an aspect of architecture having a close relation with society (Hillier, 2007; Penn, 2008). The investigative phase was conducted through two approaches: i) a quantitative approach: aggregate data about spatial nature of hospital building (space syntax techniques and functional analysis); ii) a qualitative approach: social survey methods in which the focus was on people behaviour.

To study the interface on spatial field, we compared configurational data of spatial layout with behavioural data of users collected by direct observation. First of all, we created two spatial models: a public model, considering all spaces accessible to public users (patients and visitors), and a staff model considering spaces accessible only to medical staff. These two models were created to identify whether spatial configuration was different for these two categories.

We choose the public model because it represents the public spaces of hospital, and, according to our vision of Right to health, they are very significant spaces. Public model consists of: all corridors, all room where outpatient users arrive by itself (entrance, connections, waiting room and bathroom). The two models, public and staff, were processed with convexity analysis and the integration values were calculated. From comparison among integration maps important relations about differences, similarities and overlapping points are revealed useful to comparison with behavioural data.

Concerning behavioural and use pattern survey to reveal interactions between patients and medical staff, the method chosen for the observation was the snapshot method: a series of



photos of each space made at regular time periods during a day, in which different categories of users, positions, actions and interactions among people in the space are highlighted.

Different types of relations among observed people are classified according to categories of activity:

- Health: interactions and actions among people concerning health and care
- Social: interactions and actions among people concerning social aspect
- Wayfinding: interactions and actions among people concerning wayfinding (people looking for information on directions).

## 2.1 Spatial layout and patient-medical staff interface

Interactions reveal the need of people. Through the identifications of interactions it is possible to discover what kind of relations people are seeking to create in order to fulfil their Right to health.

The question we asked ourselves studying this phenomenon at the building scale is about which are the architectural elements affect the patient-medical staff interface.

From the comparison between spatial analysis and patterns of use behaviour analysis we observed how the space, according to its configuration, creates and controls the interfaces among different categories of people.



**Figure 3** Density of interactions in observed spaces in Montepulciano Hospital and Santa Maria Nuova Hospital. Spaces in hospital where divided in several convex spaces which are the same used in configurational analysis.

First we looked at the general data related to the density of interactions; in the maps in Fig. 3 we see that the corridors are spaces with a high degree of interactions. Then we go to look at the data related to the interactions between patients and medical staff at the scale of the entire hospital, always considering only public spaces.

Public spaces (waiting area, corridors, connecting spaces) are spaces with high degree of informal interactions. Informal interactions are those interactions happening out of institutional places as reception or information desk and consultant room.

Analysing our three case studies, we noticed the presence and the number of informal interactions between patient and medical staff. Interestingly, a significant number of informal interactions are health related.

The table 1 shows that the number of informal interactions between patient and medical staff is consistent in all three cases and is between 60% and 85% of the total medical staff-patient interactions. Among these, the 'health interactions' constitute a large part, from 26% of Santa Maria Nuova, 38% Montepulciano to 40% of Careggi.

**Table 1** Percentage of Patient-Medical staff interactions

<b>No P-M Interactions</b>	<b>100%</b>	<b>No P-M informal Interactions</b>	<b>100%</b>
<b>Santa Maria Nuova</b>			
No P-M informal Interactions	60%	Social	40%
No P-M formal Interactions	40%	Wayfinding	33%
		Health	26%
<b>Montepulciano</b>			
No P-M informal Interactions	84.5%	Social	47%
No P-M formal Interactions	12.5%	Wayfinding	9.4%
		Health	38%
<b>Careggi</b>			
No P-M informal Interactions	69%	Social	50%
No P-M formal Interactions	31%	Wayfinding	10%
		Health	40%

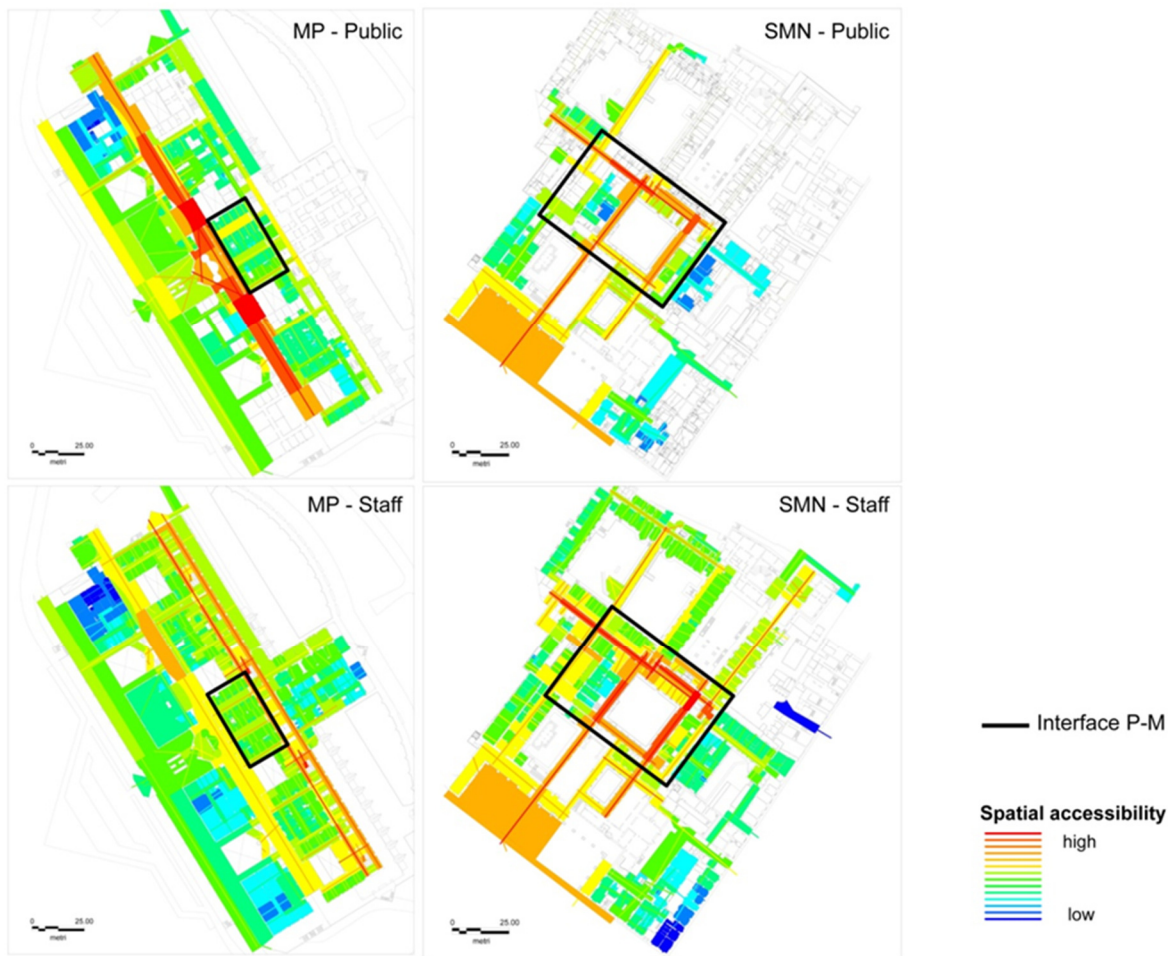
In the light of these data, the next questions where: where are these interactions generated? What are the characteristics of the spaces where they happen? Do these spaces support interfaces between patient and medical staff?

To answer these questions it was necessary to analyse the spatial models processed where we can compare the values of integration, the shape of the Integration core and the core of accessibility of the building. We can see then in the maps in Fig. 4 how the Integration values are distributed and where the core of accessibility is situated in public and staff model of two of the three hospitals case studies.

A first consideration should be given on the distribution of the Integration and spaces more accessible and less accessible in the buildings. The maps show that in Santa Maria Nuova (SMN) less integrated spaces for staff are also those less integrated for patients and more integrated spaces for staff are also the most integrated for patients. Here then there is a match in the levels of accessibility between the staff spatial model and the public spatial model. We cannot say the same for Montepulciano (MP), where the relationship is much weaker, i.e. the Integration values are distributed differently in the two models and spaces with high accessibility do not coincide.

Secondly we look at the structure of the Integration core, the most accessible part of the building, (core of accessibility). In SMN the Integration cores of the two spatial models (public and staff) overlap. In MP the two cores are different and there are no overlaps.

If we compare spatially where informal interactions between patients and medical staff occur, we note that in the case of SMN they occur in the spaces of connection, in the corridors where the core of public accessibility and staff overlap. Whereas in the case of MP these informal interactions occur in accessible spaces connecting the core of the public model with the core of the staff model, that is in the transition area that corresponds to the outpatient area.



**Figure 4** Accessibility map (Integration RN) in Staff and Patient spatial model, with the areas (black line) where Interactions between patient and medical staff happen. Analyses were done with convexial method.

## 2.2 Findings

From the comparison between the configurational analysis and behavioural observations on the interactions some significant data emerge:

1. From the interactions density map emerges:
  - Public spaces (corridors, waiting areas, connection spaces) are spaces with a high degree of interactions among people.
  - Public spaces are spaces of informal interactions.
2. From people behaviours observations emerges:
  - In the three case studies we have a high percentage of informal interactions between patient and medical staff.
  - A meaningful number of informal interactions are health interactions.
3. From the comparison of accessibility maps of SMN and MP emerges:
  - In SMN the Integration cores (staff and public) overlap. In MP the Integration cores are different and do not overlap.



- In SMN the interface patient-medical staff (P-M) occurs in spaces where integration cores overlap.
- In MP the interface P-M occur in spaces in between the integration cores, corresponding to outpatient area.
- In MP gallery there aren't P-M interactions

### 3. Results and discussion

From the viewpoint of spatial-configurational elements different types of interfaces between users are determined by different structures of the layout, different shapes of the Integration core, different values of accessibility, different degrees of proximity of the place of performance delivery from the access to the outpatient area and from the location of the corridors.

From the organizational point of view interfaces are influenced by various organizational systems: health flows, patients flows, overlapping of the two flow systems, location of the reception desk respect to the patient flow.

In the light of the analysis carried out, the structure of the building as a whole in its spatial and organizational part, allows us to predict and understand where it is more likely to happen the interface between categories and then check out the interface in relation to the Right to health, which, as we mentioned above, is closely related to the patient-medical staff relationship. By identifying these determinants of interfaces we can establish at the decision-making phase how we want to favour and control these interfaces between patients and doctors in relation to the objective of spatial and organizational transformations.

The spatial-configurational elements which affect the patient-doctor informal interaction and can give us information about how and where these interactions can occur, are:

1. System of public Integration core
2. System of staff Integration core
3. The system of public accessibility (value of integration)
4. Horizontal linkages between the cores
5. Functions of spaces
6. Functions of departments

The shape of the Integration core of public and staff spatial models and the relationship between the two are key factors strongly influencing the P-M interaction.

We can say that if the public and staff core overlap is likely that P-M interactions occur inside the overlapping core; it is the case of Santa Maria Nuova hospital. This is because the core represents two spatial models referred to two categories of users. In this case the most integrated spaces for one are the most integrated for others and the overlapping of the most accessible areas for the two categories becomes a point of probable interface.

If the public and staff core are separated then we need to identify if the cores are connected with public corridors, whether there are functions for outpatients in these connections, and which is the degree of integration of these spaces. If they are well connected to each other, according to the room function that are there, it is likely for interactions to occur in those corridors connecting the two cores because they constitute the point of transition between the

system of public paths and the system of health paths (between the public core and health core).

In summary we can say that P-M interactions happen mostly in overlapping core spaces if the two cores, public and staff, overlap or in transition spaces between the two cores if they don't overlap. Specific value of integration of the space does not necessarily affect P-M interactions; it is rather the presence of overlapping cores (public and staff) or the presence of integrated transition spaces between the two that foster P-M interactions.

In this research organizational and spatial factors have been identified to the scale of the entire building that may affect generating of informal interactions between patients and medical staff. The combination of these factors is crucial in the creation and control of the interface between patient and doctor. This combination needs to be studied more in a detailed way facing with the scale of the outpatient area, for example.

To summarize, building structure allows us to understand where it is more likely to happen the interface between the patients and medical staff categories. Space, depending on how it is configured, creates and controls the interfaces between different categories of people. Different structures of the layout generate different types of interfaces (and interactions) between users, for example, between patients and doctors. This knowledge can be beneficial both in the context of decisions for both organizational and spatial transformations. We have to ask ourselves, and each hospital board has to do the same, which kind of spaces we want to create. Where we want these interactions are going to occur? Are they helpful to improve the take in charge of patients? Which image do you want to create for your hospital?

Some answer to these questions need to develop further research and analysis. The results reached until now are only a starting point.

#### 4. References

- Allison, David. 2007. "Hospital as city. employing urban design strategies for effective wayfinding." *Health Facility Management* 20(6):61.
- Curtis, Sarah et al. 2009. "New spaces of inpatient care for people with mental illness: A complex 'rebirth' of the clinic?" *Health&Place* 15:340-348.
- Evans, Gary W. 2003. "The built environment and mental health." *Journal of Urban Health: Bulletin of the New York Academy of Medicine* 80(4):536-541.
- Fiset, M., 2006. "Hospitable hospitals: creating a healing environment." in *International Hospital Federation Reference Book 2005/2006*(IHF) 36.
- WilGesler et al. 2004. "Therapy by design: evaluating the UK hospital building program." *Health and Place* 10(2):117-128.
- Hillier, Bill. 2007. *Space is the machine: a configurational theory of architecture* (London: Space Syntax)
- Hillier, Bill, and Laura Vaughan, 2007. "The city as one thing." *Progress in Planning* 67(3):205-230, doi:10.1016/j.progress.2007.03.001.
- Longo, Erik. 2012. *Le relazioni giuridiche nel sistema dei diritti sociali. Profiliteorici e prassicostituzionali*(Padua: CEDAM).
- Longo, Erik, and Nicoletta Setola. 2009. "Towards a spatialdimension of social rights. New perspectives in architecture and law studies." *Interdisciplinary Themes Journal* 1:100-111.
- Penn, Alan. 2008. "Architectural Research." in *Advanced research methods in the built*

- environment*, edited by Andrew Knight and Les Ruddok (Chichester: Blackwell Publishing Ltd) 14-27.
- Penn, Alan et al. 2007. "Structure, agency and space in the emergent of organisational culture", in *Proceedings 6th International Space Syntax Symposium*, edited by Ayse Sema Kubat et al. (Istanbul: ITU).
- Setola, Nicoletta. 2011. "Santa Maria Nuova Hospital: the public space system." in *Research tools for design. Spatial layout and patterns of users behaviour*, edited by Nicoletta Setola (Florence: Firenze University Press).
- Torricelli, Maria C. et al, 2010. "The strategic role of interfaces between levels in complex buildings design." in *International Conference on Open and Sustainable Building*, (Bilbao: CIB W104) 99-109.
- Ulrich, Rogers S. et al. 2008. "A Review of the Research Literature on Evidence-Based Healthcare Design." In *Healthcare Leadership, White paper series 5 of 5*, ed. Rogers S. Ulrich et al. (USA: The Center for Health Design and Georgia Institute of Technology).
- Verderber, Stephen, and David J. Fine. 2000. *Fine Healthcare architecture in an era of radical transformation* (New Haven and London: Yale University Press).
- WHO. 2008. Office of the UN High Commissioner for Human Rights, *The right to health: fact sheet no 31. June*, accessed April 12, 2013, <http://www.ohchr.org/Documents/Publications/Factsheet31.pdf>.