

## **BUILDING FOR THE FUTURE: THE SCIENTIFIC VISION BEHIND THE “NOUVEAU CENTRE”**

### **A. Introduction**

1. The International Agency for Research on Cancer (IARC) has been based in Lyon since its creation in 1965. The French government, the Department of the Rhone and the City of Lyon provided the IARC tower building which was opened in 1972 and included offices, laboratories and conference facilities. Two further buildings, the Biological Resource Centre and the Latarjet buildings, were added in the 1990's, to provide space for the biobank and additional laboratories and offices, reflecting the growth of the organization over the first quarter century. The current facilities of around 10 000m<sup>2</sup> are filled to capacity and there is increasing pressure on space.

2. From the beginning the Agency comprised epidemiologists, biostatisticians and laboratory scientists. Whilst the underlying principle of an interdisciplinary research institute was visionary, the building itself is now physically in a poor state of repair and no longer provides suitable facilities for a modern, high-quality research organization. This document describes the rationale for a new building in line with the future scientific vision for the Agency – it specifically does not deal in any detail with the more administrative questions of security, parking, access and engineering aspects of the building. It does however set out a number of design priorities and proposals which address the current and foreseeable medium-term needs of the Agency, and which should serve to inform the discussion between IARC, the City of Lyon and the architect team ultimately in charge of the design, should the decision be made to proceed with the construction of a new building.

3. Whilst anticipating where developments in cancer research will lead the science in the next 20 to 30 years would be impossible, it is reasonable to anticipate the broad approaches, skills and infrastructure required to conduct research consistent with the IARC Statute over that timeframe. It is the latter topic which is addressed in this short document.

## **B. Cancer in the 21<sup>st</sup> century**

4. Cancer is a barrier to sustainable development. Along with other noncommunicable diseases (NCDs), cancer burden is projected to rise markedly in the next 20 years with the greatest increase in countries in the lower categories of the Human Development Index (HDI). Typically such projections are made only on the basis of demographic changes. Superimposed on increases in population size and average lifespan, is an epidemiological transition whereby more westernized lifestyles (tobacco, alcohol, obesity, physical inactivity, reproductive changes) will add NCDs to communicable diseases to produce a "double burden" on the populations in the lower HDI countries. These challenges are being faced in countries where the health services are least able to cope with the medical, economic and social impacts.

5. The rises in cancer incidence will be accompanied not only by more deaths but also by a greater prevalence. For example, while 7.6 million people died of cancer in 2008 there were nearly 29 million living within five years of a cancer diagnosis. Thus the scale of care needed for cancer patients undergoing treatment or under surveillance subsequent to treatment will also rise markedly.

6. While cancer shares a number of common risk factors with some other NCDs, including cardiovascular disease, diabetes and chronic respiratory diseases, it is distinct in that the major risk factors and prevention strategies are far broader. Furthermore, the same type of cancer can be caused by distinct risk factors in different geographic areas of the world. This heterogeneity in patterns of cancer and the underlying risk factors, demand not only a strategy for control that reaches beyond other NCDs but also implies a research agenda that is adapted to national priorities.

7. In summary, the marked increase in cancer burden expected in the coming decades, means it is not a credible solution to treat our way out of the cancer problem. Prevention represents an important, cost-effective priority which will need to be tailored to national needs. Research is a prerequisite for this, coupled with a commitment to implementation of research findings.

## **C. Cancer research in the 21<sup>st</sup> Century**

8. Cancer prevention has the potential to achieve much, with estimates of 30–40% of cancers being preventable based on current knowledge. However, further progress in the development and implementation of effective cancer prevention strategies requires an evidence-base that is currently lacking. Partially this is because research into prevention has been chronically under-funded in comparison to basic science and clinical translational research. Furthermore, cancer research in developing countries has hardly been a priority and here the pattern of risk factors can be quite different. As the political awareness of cancer as a development issue and the focus on prevention both grow, the Agency is excellently placed to respond to future international cancer research and control needs.

9. Cancer prevention must therefore be a core component of cancer control in the coming decades; however, what does cancer prevention comprise? First is describing the cancer burden, including incidence, mortality, prevalence and survival. Without this descriptive data it is not

possible to effectively target and prioritize initiatives, and the foundation for cancer prevention and control is missing. Second is establishing the causes of the disease. Such etiologic studies require strong methodology as well as access to appropriate populations and bio-specimens. Third is evaluating prevention strategies, through well-designed trials and observational studies of routine programmes. Fourth is analysing optimal ways to implement effective interventions within particular health services settings. These four components:

1. describing the burden;
2. establishing the causes;
3. evaluating the preventions;
4. analysing the implementation;

combine to provide an evidence-base for cancer prevention and control.

10. At the same time as demographic changes are affecting overall cancer burden, there has been remarkable progress in understanding the underlying molecular pathways that drive disease development. Sequencing of the human genome and an appreciation of the different mechanisms by which molecular alterations can lead to malignancy are providing exciting opportunities for improved patient management. Moreover these same developments can and will make important contributions to cancer prevention, particularly in relation to establishing the causes of cancer and evaluating prevention initiatives. Notably these include: refined measures of exposure to risk factors; examination of exposure in relation to molecular sub-sets of tumours; the individual genetic and epigenetic basis of cancer susceptibility; study of gene-environment interactions; early detection of disease; identifying molecular targets for intervention; use of mechanistic information in hazard and risk factor identification, among other areas.

11. Whilst at one end of the spectrum cancer epidemiology reaches uncontestedly towards the laboratory, for the reasons outlined, it must also extend its reach towards the social and behavioural sciences if it is to maximize the successful implementation of its findings. Thus cancer research demands, more than ever, a truly interdisciplinary approach in the area of cancer prevention.

#### **D. IARC in the 21<sup>st</sup> century**

12. The mandate of IARC has some specific features. A primary one is the emphasis on promoting collaboration. Here the Agency has a catalytic action which belies its size. This has translated over nearly five decades into an extensive network of collaborators and a degree of respect globally which enables it to meet its objectives. The credibility of the Agency arises not just from its international status within WHO, although this is undoubtedly a strength, but from the outstanding reputation of its scientific staff for high quality, independent research, and from its ability to invest in coordination, pilot studies, training, meetings and scientific exchanges. Effective use of resources through international collaboration is critical for the future of cancer research.

13. On a related note, research increasingly needs international studies to answer national questions. The wider range of exposures and the larger numbers of cancer cases accrued in international, multicentre studies yield answers that simply cannot be obtained nationally. The coordination role of IARC is thus ever more valued.

14. There is an increasing call for independent, authoritative and systematic evaluations of evidence on cancer burden, tumour classification, risk factors and the effectiveness of cancer prevention strategies. Many countries are unable to produce such expert evaluations and look to IARC, as a part of WHO, to provide this advice with expertise and integrity. Given the exponential volume of research findings this ability to produce a reliable, respected evidence-base will remain a major opportunity for IARC.

15. The Agency conducts studies and collaborates with scientists all over the world, but has a particularly strong track-record of working in the less developed regions. As cancer sadly comes to the fore in these countries the Agency finds itself well-placed to build on its standing among collaborators and governments, founded on previous experiences of trust and cooperation. In the lower HDI countries the need, but also the enthusiasm, for collaboration with IARC is ever growing, particularly in areas of cancer prevention and implementation research.

16. From its inception the Agency has had an inherent multidisciplinary approach which was ahead of its time, and which has often been difficult to emulate in national centres. The close link between laboratory and epidemiological research is of paramount importance to the culture of the Agency, allowing a dynamic interchange of scientific information that contributes to the development of novel interdisciplinary collaborative programmes. This culture of scientific exchange now places IARC in an excellent position to benefit from the advances in application of the molecular to the population sciences.

17. It is clear that the underlying mission of the Agency, its expertise and activities are aligned with the demands of the future global cancer research agenda.

## **E. A building for a purpose**

18. Given the above context for trends in cancer burden, evolution of cancer research and the specific role of IARC – what type of new building does the Agency need?

19. The above outline indicates that the Agency needs a building which:

- enables interdisciplinary cancer research; this works best when the scientists share overall objectives, budgets and space in an infrastructure which promotes informal exchanges;
- has dedicated space for its increasing bio-specimen resource centre;
- permits effective processing, storage and retrieval of large amounts of highly complex research data in a secure manner;
- has facilities to host the many meetings, conferences, workshops and training courses which sit at the heart of the collaborations it seeks to promote;
- has a range of types of accommodation for its permanent staff and many visitors at different levels of seniority;

- has capacity for expansion, reflecting the increasingly international nature of cancer research, the growth in the international research community and the evolving demands on IARC for cooperation;
- has a lower environmental footprint, ensuring at the same time substantial reductions in running costs;
- provides an environment that promotes the well-being of its staff;
- is adaptable, allowing it to respond to the changes in focus of cancer research over the next 30–50 years.

20. The above points are reflected in some of the specific components developed in more detail below:

**Continued focus on interdisciplinary research:**

21. The Agency has major strengths in cancer epidemiology, attracting international collaborators keen to take advantage of the expertise in statistical analyses and data interpretation. In addition, the integration between epidemiological and laboratory research is a strength. The balance between epidemiological and laboratory science will be maintained in the new building, and a design comprising fewer floors should encourage scientific exchanges and interdisciplinary collaborative research.

**Well-equipped laboratories:**

22. In order to attract leading laboratory scientists, the Agency needs sufficient high-quality laboratory space and state-of-the-art equipment to enable effective research. This does not need to be a large-scale, high-throughput facility on a par with specialist national centres. In addition, it does not need to include specialized facilities that demand a high maintenance cost and could be accessed through collaboration e.g. an animal house or highly-specialized technology such as nuclear magnetic resonance.

23. The Agency has achieved a good balance between its own facilities and those of collaborators over the years, with the guidance of its Scientific and Governing Councils. A recent example is the investment in next generation sequencing. The availability of this equipment at IARC has stimulated many new research projects which would otherwise not have happened. At the same time, close collaborations have been established with local facilities, for access to both complementary sequencing technologies and bioinformatics expertise, while large-scale sequencing studies have been out-sourced to national centres.

24. The laboratories in the "Nouveau Centre" need to be designed quite differently to those currently available. The tower structure results in repetition of facilities on different floors e.g. cell culture, cold rooms etc. In the new building there will be economies of space with shared core facilities, in addition to the dedicated bench space assigned to different research groups. The fewer number of floors in the new building will enable this integrated design. The location of the laboratories on the lower floors of the building will also bring benefits of security and ease of delivery and provision of services compared to the current situation (laboratories on floors 6 to 10 of the tower).

### **Dedicated biobank facility:**

25. The value of biobanks to the cancer research community is increasingly recognized and IARC plays a leadership role in development of international standards. The sample collections stored at IARC, coming from diverse regions around the world, are recognized as an exceptional asset for conducting epidemiological studies. The Agency is making these resources available to the research community through a defined access policy. Its current biobank was not designed as an integrated facility and thus comprises a heterogeneous set of freezers spread over a number of locations.

26. In the future the Agency will expand its role in international biobanking and will seek to support activities in lower HDI countries in particular, with the possibility of offering a centre for storage of duplicate specimens for collaborating centres. Therefore the new building would comprise an expanded facility for the IARC Biobank with dedicated space and an integrated storage system with room for housing of future collections. Such an integrated facility would include: (a) rationalization of the liquid nitrogen storage capacities, with the potential of an automated cold room solution; (b) cold chain processing capacity for receiving and shipping of samples; (c) proximity to laboratories and building exits; (d) modernized security and temperature control and monitoring systems.

### **IT infrastructure:**

27. The Agency handles large datasets both because of its multicentre, international studies but also because of the vast amounts (terabytes) of data generated through its application of laboratory analyses ("omics" technologies) to bio-specimens from epidemiological studies. The increasing quantity of data requires expansion in the computing capacity to permit bioinformatic and biostatistical analyses. At the same time there are increasing demands on data security and confidentiality for population-based studies. The new building will be designed to meet these modern needs for high-quality, flexible and expandable IT infrastructure.

### **Conference facilities and meeting rooms:**

28. Scientific communication and training are at the heart of the Agency's activities. Hosting several hundred visitors per year, IARC organizes many meetings and workshops through its consortia and other collaborative studies. It provides education and training through its courses programme and also hosts a number of major scientific seminars as well as the meetings of its governing bodies. The conference facilities of the Agency are made available to local and national organizations offering one mechanism to promote close cooperation with the scientific community in Lyon and the surrounding areas.

29. In addition to the large-scale meeting rooms and auditorium, the Agency requires smaller meeting rooms for scientific interactions at the Group and Section level. Current facilities are ill-adapted in size and flexibility to the needs of the Agency. Recognizing that training, collaboration and exchange are central to the Agency's mission and are expected to develop further, the new building is being designed with a range of flexible facilities for hosting meetings and training courses, including distance learning and videoconference facilities, from an auditorium through to small meeting rooms.

**Mixed accommodation of open-plan and offices:**

30. The current tower structure has a heterogeneous mix of large and small rooms, some having been originally designed as laboratories now used as offices and vice-versa. Many are overcrowded and ill-adapted to their purpose. The new building offers an opportunity to adhere to new norms of office space allocation; to create a good blend of open-plan, shared and individual offices; and to reduce the wasted space in the corridor areas caused by the current tower configuration.

**Room for expansion:**

31. The underlying principle of the Agency as a catalyst for international collaboration means that it should not aspire to a marked expansion in numbers of staff without a major change in its mission and Statute. Therefore the proposed new building involves mainly a more efficient use of space, but with an additional 20% increase in the overall footprint to provide an element of growth for the future. Specifically, the Agency presently occupies 10 000m<sup>2</sup>, and the planning figures for the new build are 12 500m<sup>2</sup>. The rationale for this expansion has a number of different components as mentioned below.

32. The Agency is facing increasing requests for its collaboration and leadership. This is expected to continue given the growing global cancer burden, the focus on lower HDI countries and the value of international cooperation. In addition, the scope of cancer research falling naturally within the IARC mission is expanding, notably in the areas of implementation research, development of laboratory tools for epidemiology and biobanking, which will require additional space. The latter two areas have been briefly described above. The former presents a natural opportunity for IARC to conduct research into what hinders and helps when implementing prevention strategies into the healthcare settings encountered in the less developed countries. This will necessitate some new resources to permit recruitment of expertise, for example in the social and behavioural sciences, pertinent to this area of activity.

33. IARC currently has 22 Participating States (PS) among the 194 Member States of WHO. It is expected that economic constraints on existing IARC PS will continue and that financial contributions will remain stable for the foreseeable future. However, there is optimism about increasing the number of new PS and it is this which will present opportunities to expand the depth and scope of the Agency activities in the coming years. This increased interest reflects the expansion of cancer research internationally, with far more research now conducted in the southern hemisphere. This is complemented by the increasing political importance being placed by lower HDI countries on cancer control.

34. In 1965 IARC had seven PS and in the 25 years to 1990 this expanded by nine additional countries. In the last decade six more have joined, with one, possibly two, additional applications to be considered in 2013. Those joining in the last decade include countries from geographic regions not previously represented. The Governing Council recognized the value of this expanded membership in 2012, placing no restrictions on the number of new PS. Based on current figures the inclusion of seven additional PS during the next ten years, for example, would increase the Agency's core budgets by approximately 27%, resulting in a likely 30% increase in the work force through both staff and non-staff contracting mechanisms.

35. As cancer is increasingly recognized as a barrier to sustainable development there will most likely be additional expectations from PS for IARC, as an instrument of the UN, to provide support to national responses to the global NCD agenda. This may permit new voluntary contributions to further support existing areas of research which are under-resourced, a measured increase in those areas of strategic development mentioned above, a growth in demands for expert evaluations (i.e. Monographs and Handbooks of Cancer Prevention) and support to cancer surveillance through the Global Initiative on Cancer Registration in Low- and Middle-Income Countries.

36. Notwithstanding the above arguments it is prudent to design a building with flexibility in relation to the increased capacity. We intend to achieve this through a combination of the use of open plan office arrangements, potential for future building development incorporated in the initial design and best estimates for targeted expansion (i.e. biobank needs). The space created will retain a maximum degree of flexibility to allow adaptation to future requirements.

**Environmental footprint:**

37. The IARC tower was planned and built at a time when energy efficiency was not seen as a major priority. The substantial heat losses that result from its poor insulation place a continuous strain on the building's heating and air-conditioning systems and result in high maintenance and energy charges that constitute an important drain on the Agency's resources. A modern building, built to current standards, would have much lower energy consumption, ensuring not just a lower environmental impact but also a considerable reduction in the building's operating costs.

**Well-being of staff:**

38. The current IARC buildings do not provide the features for staff well-being that are increasingly seen as essential in ensuring an effective workforce. Therefore the new building will have a small gym and adequate changing-room facilities to encourage the practice of sports among staff or travelling to work by bicycle, a staff room and rest and relaxation areas, including provision for mothers to breast-feed their babies. These facilities will ensure that the new building is not just better adapted to the work of the Agency but that it provides a better, healthier working environment for its staff.

**F. Conclusion**

39. The Agency stands at a point in time where its mission is more pertinent than ever to global cancer control. Its broad research themes and technical approaches, as well as its recognized international standing and success, provide sufficient confidence to plan and build a facility that equips IARC for the coming decades. This new building will not only provide a suitable environment for its researchers to work but will also send a strong signal of commitment from the IARC Governing Council of adherence to the original, generous vision of an international agency dedicated to fighting cancer throughout the world.