TOTAL AREA OF INSECT VECTOR HABITATS	
GENERAL CONSIDERATIONS	
Issues	Insect-borne diseases
Type of indicator	Exposure (distal/state) Can also be used as an action indicator for interventions aimed at eliminating or managing insect vector habitats.
Rationale	The distribution of insect-borne diseases is largely determined by the availability of suitable habitats. The existence of these habitats does not always imply disease risk, for in some cases they occur far from human habitation, so the chances of disease transmission are small. To a large, and in many cases increasing, extent, however, these habitats are a result of human management of the land – for example, irrigation, drainage, vegetation clearance, and cropping. Opportunities for disease transmission are therefore great, and likely to rise as populations in these areas increase. The total area of available habitats thus provides a measure of the potential for insect-borne diseases.
Issues in indicator design	Defining the extent of habitats suitable for insect vectors is not always easy. The habitat requirements of the insects concerned are often complex, and depend not only on the availability of suitable breeding and feeding grounds, but also an ecological niche within which stable populations can develop. Factors such as species diversity, predator numbers, and details of the life cycle of all the other species on which the insect vector depends are therefore crucial. Even when habitat requirements and ecological dependencies are known, difficulties may be encountered in obtaining reliable and up-to-date information. Use of Earth observation (e.g. satellite) data has greatly enhanced the ability to model and map vector habitats, and the body of field information is also increasing in many countries. Nevertheless, for many insect vectors, in many areas, it is still necessary to rely on models of habitat suitability and extent that have not been well-validated at the local level.
SPECIFICATION	
Definition	Percentage (or total) of area providing actual or potential insect vector habitats.
Terms and concepts	***Insect vector:*** an insect species that is instrumental in the transmission of a human disease. Many of the most important insect vectors are mosquitoes (e.g. for malaria, dengue) or flies (e.g. sleeping sickness). ***Insect vector habitat:*** an area of land (often defined in terms of its vegetation, land use and climate) which provides an actual or potential habitat in which the insect may breed and maintain a population over the long term. Many of the most important habitats are associated with water bodies, such as ditches, streams, reservoirs or lakes.
Data needs	Boundaries (or estimated extent) of areas suitable as stable habitats for insect vectors. Total land area.
Data sources, availability and quality	Data on the distribution and extent of insect vector habitats may come from two main sources: from field observation of the distribution of the species concerned, or from modelling of their potential habitats (e.g. using satellite and other data). The reliability of modelling has improved greatly in recent years, as the range of data on land cover and meteorology has expanded. A growing body of information is also becoming available from field monitoring of insect vectors (e.g. by research groups and aid agencies). Even so, maps and estimates of the distribution of suitable habitats may be subject to considerable error, especially in more remote areas where validation is difficult, or in areas where rapid land use change may cause marked changes in habitat condition and extent. In particular, it is often difficult to define clear boundaries to many habitats because of the transitional nature of

	the land cover and climate. This means that comparisons between estimates made by different people, or with different techniques, need to be made with caution.
Level of spatial aggregation	Region (or more local where detailed data exist)
Averaging period	Annual-decadal (depending on data availability)
Computation	The indicator can be expressed as a simple percentage: *100 * (Avect / Atot)* where: *Avect* is the area of habitat suitable for the insect vector; *Atot* is the total land area.
Units of measurement	Percentage (or total) area
Worked example	Assume that an area contains 14 600 ha of habitat suitable for insect vectors, from a total land surface of 360 200 ha. In this case the value of the indicator is calculated as: 100 * (14 600 / 360 200) = 4.1%
Interpretation	This indicator provides a simple measure of the extent of insect vector habitats. As such, an increase in the indicator can be considered to represent an increase in the potential risk of disease transmission, a reduction a decline in risk. In interpreting the indicator, however, it is important to recognize that it takes no account of the intensity of risk – e.g. due to variations in the density of either insect or human populations. Uncertainties are also likely in the estimates of habitat area, and differences in methodology may mean that comparisons between estimates from different areas (or at different times) need to be made with care.
Variations and alternatives	An alternative (and possible improvement) to this indicator would be to base it on an estimate of the density, rather than the extent, of the insect vectors. This is possible where reliable data on the size and distribution of the insect vectors are available. Information on the extent of the habitats can also be combined with data on the number of children resident in each area, to provide an indicator of the exposure risk. However, because the numbers at risk may vary because of population changes, this indicator cannot be interpreted directly in relation to habitat extent.
Examples	WHO *Environmental health indicators: framework and methodologies* • **Population at risk from vector-borne diseases**
Useful references	MARA (Mapping Malaria Risk in Africa) website: http://www.mara.org.za WHO 1994 *Information systems for the evaluation of malaria control programmes, a practical guide. AFRO/CTD/MAL/ 94.3.* Brazzaville: World Health Organization Regional Office for Africa. WHO 1999 *Environmental health indicators: framework and methodologies.* Geneva: World Health Organization. (Available at http://www.who.int/docstore/peh/archives/EHIndicators.pdf)