

Environmental History within a Revitalized Integrative Research Methodology for Today and Tomorrow

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In the past decades, historians and scientists worldwide have focused intensively on researching and recording the micro and macro trends of the environmental history of many places with reference to numerous aspects of nature that involve people. Yet no definite methodology, epistemology or even theory has resulted from these research contributions, which were and are being conducted within disciplinary and sometimes interdisciplinary frameworks. The transdisciplinary research approach, at least as practiced by historians, is a 'newcomer', although it features familiar criteria. For several reasons, some historians appear to be neither in favour of, nor familiar with, research co-operation with other disciplines, private practitioners or informed community members. There are obstacles to using a research methodology that complements the interdisciplinary or transdisciplinary approach, especially the grey areas of research quality, source validity, methodology and publication value. However, if approached constructively and meaningfully, transdisciplinary research may result in what we could call higher-order research because it is all-inclusive and can provide diverse perspectives on any theme, for example, environmental history. This article discusses the possibility of progressing towards 'transdisciplinary' as part of an integrative multidisciplinary approach in research on environmental history. An integrative multidisciplinary ('triangular') research model is proposed, especially for use by historians and others who want to approach environmental research from disciplinary, interdisciplinary and transdisciplinary perspectives. It is also hoped that this discussion will stimulate the debate by historians on research co-operation with the social sciences and humanities, as well as collaboration with non-related sciences in environmental history.

KEYWORDS Integrative Research, Environmental History, Research Methodology, Interdisciplinary, Transdisciplinary, Integrative Multidisciplinary Research

Introduction

In the past three to four decades, historians and scientists worldwide have focused intensively on researching and recording the micro and macro trends of the environmental history of numerous places with reference to aspects of nature that involve people. However, no definite methodology, epistemology or even theory has resulted from these research contributions, which were and are being conducted within disciplinary and sometimes interdisciplinary frameworks. The transdisciplinary approach as practiced by historians is a newcomer concept, although it does have features that are familiar in the long-standing historical research methodology.

Although collaborative and integrative research in environmental history elsewhere in the world may be thriving, this appears not to be the case in South Africa (my home country) among the limited number of environmental historians (compare Carruthers 2006b, 809; Steyn 1999; Walmsley and Walmsley 1993, 7; Finnberg and Skipp 1967, 2–44).

Furthermore, some environmental historians and academics from most other disciplines in the humanities (whose research methodologies closely relate to those in History) appear to find it difficult to embark on interdisciplinary research when the opportunity arises. Historians apparently find it much easier when undertaking a research theme to borrow information from other fields and disciplines than to collaborate with researchers from other disciplines.

Ironically, within the methodological framework of historians who focus on local and urban themes, interdisciplinary research is a prerequisite if the main aim is an integrative and representative account of local events (Finnberg and Skipp 1967, 44). Research in these fields normally includes many aspects related to the environment. As pioneers of the methodology of local history, Finnberg and Skipp (1967) remarked about local history research that:

Indeed, since at its fullest range it lays most of the other historical disciplines under contribution, a good case could be made out for regarding it [local history] as the most advanced of them all . . .

However, if environmental historians find it difficult to collaborate regularly and not just occasionally in an interdisciplinary research environment, it can be argued that they may be even more unwilling to engage in transdisciplinary research. A counter-argument may be that local historians who deal with a very broad spectrum of events related to human activities that can hardly be excluded from the regional environment and its ecological history, will be methodologically more skilled to undertake environmental research from a transdisciplinary angle. It does not matter whether this research relates to slow- or fast-developing environmental crises (Van Eeden 2010a, 191–208).

Scientists, especially from disciplines other than the humanities, were exposed to the concept of transdisciplinarity in the early 1970s (Jantsch, in: Tress *et al.* 2004, 479–93). Transdisciplinary (TD) research appears to be more common in pioneering initiatives and application opportunities in the natural sciences (Van Eeden 2008a) and the health sciences (Van Eeden 2008b). The

founder of the TD research methodology — physicist Basarab Nicolescu — set the example in his 2008 publication on TD by showing how TD can be applied in History as subject. The historian Donald A. Yerxa (Nicolescu 2008, 100) argued that a TD approach may offer the best hope of recovering a more meaningful past as ‘the past is too important to leave to historians alone’.

TD as a research methodology in the social sciences and humanities has not been well exploited. In essence, this article aims to serve as the opening of a debate among scholars involved in environmental history on the possibility of progressing towards transdisciplinary work as part of an integrated multidisciplinary approach to research related to the environment. An integrative multidisciplinary ‘triangular research model’ is proposed for use, especially by historians who deal with environmental research from disciplinary, interdisciplinary and transdisciplinary perspectives. Currently, many inhabited local environments are experiencing ecological crises. Among others, these crises are also opening up debate on linking a local area’s environmental history to eco-health issues (Mitman 2005, 184–209). Figure 1 serves as a practical guide for environmental historians to progress in integrative multidisciplinary research from a disciplinary research methodology to interdisciplinary collaboration and a more inclusive transdisciplinary research approach. Eventually, the level of application will determine to what extent research contributions will be of value, for example, to policy makers, communities and even to researchers in other fields besides environmental history.

Environmental history and its interdisciplinary ‘features’ *cum* transdisciplinary opportunities within an integrative multidisciplinary research framework

Conceptual views of Interdisciplinary (ID) and Transdisciplinary (TD)

In a number of articles published in recent years (Dixon and Sharp 2007; Hodgson and Smith 2007; Stokols *et al.* 2008), these and related concepts have been developed and extended. However, Tress *et al.* (2003, 2004) are of the opinion that articles and discussions in which these concepts are used seldom provide a clear understanding of these and related research concepts. Some researchers prefer to skip the use of interdisciplinary and transdisciplinary as concepts and refer to their research activities in a multidisciplinary environment as ‘strategic’ research (Dixon and Sharp 2007). According to Stokols *et al.* (2008), the thinking along these lines has thus far evolved mainly from the perspectives of the natural and medical sciences. The way that such forms of research are taken up by the humanities requires some serious debate. More specifically, the need to define the position of History (as a discipline within the basic or fundamental sciences and categorized as being part of both the humanities and the social sciences) is required in research of this nature.

Another aspect that requires consideration is that the nature of historical research is such that History as a discipline can enter into multidisciplinary discourses in research undertaken years ago (for example in the natural and the human sciences, etc.) without directly integrating with the research of disciplines from related and unrelated sciences (Van Eeden 1993). To be on

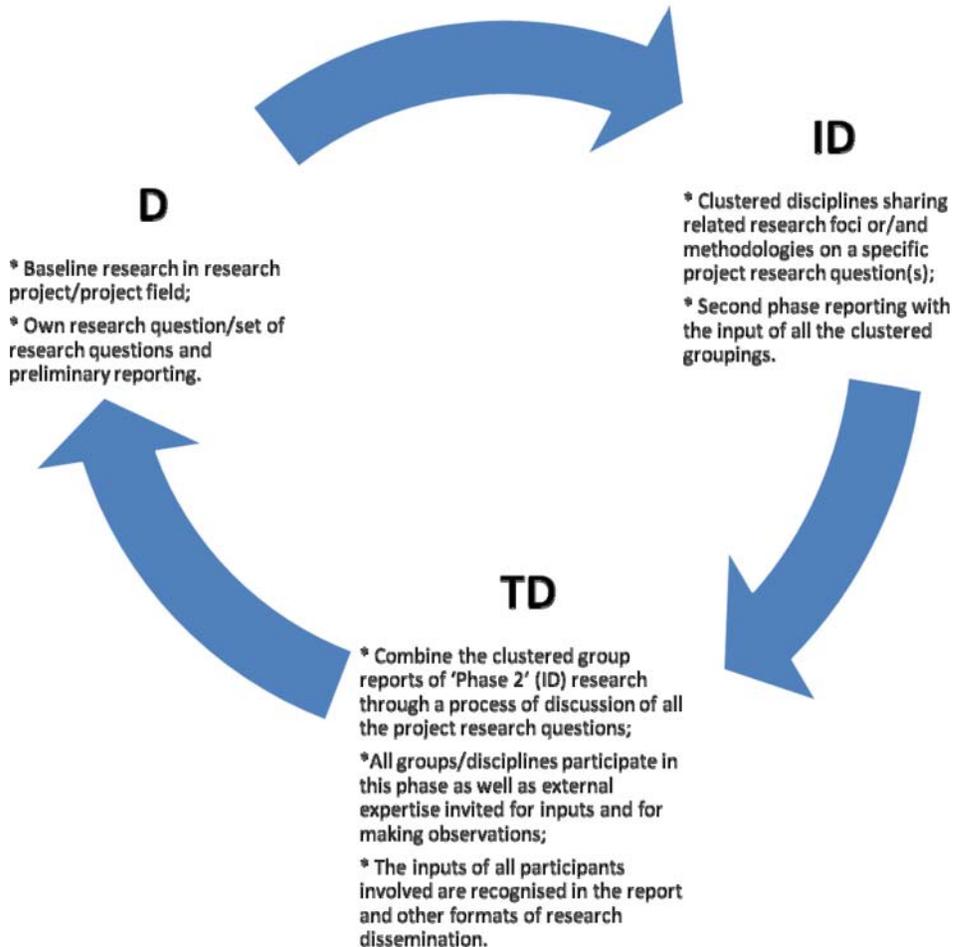


FIGURE 1 An Integrative Multidisciplinary (IMD) Research model ('Triangular' model) for progressing from the Disciplinary (D) to the Interdisciplinary (ID) and to the Transdisciplinary (TD) phases in environmental history.

the same footing with regard to the conceptual understanding of interdisciplinary and transdisciplinary, a concise definition of each is provided here.

Interdisciplinary

The concept of interdisciplinary can simply be defined as the research collaboration/involvement of several related and unrelated academic disciplines. The research theme and need as a result of an environmental crisis forces everyone to cross their subject boundaries. Therefore it can be said that a new knowledge and theory are created to achieve a common research goal that cannot be broken down into its disciplinary elements, as it would not have emerged through either disciplinary or multidisciplinary efforts. According to Tress *et al.* (2004, 2003):

The greatest challenge of integration is to bring different epistemologies together. This requires researchers to become immersed in one another's knowledge cultures, to understand the fundamental differences in their basic theories and axioms and contribute to new knowledge and theory.

However, consider what happens if research across several disciplines is conducted as part of an integrated multidisciplinary approach (see Fig 1). In that case a project moves from utilizing several ordinarily disparate methodologies in its first phase to a genuinely integrated interdisciplinary approach in its second. In this second phase different kinds of knowledge obtained from these several methodologies is brought together, preserving the disparate traces of their origins, to form a new kind of knowledge. The progress toward truly interdisciplinary research results then from separate disciplinary efforts and the transdisciplinary discussions which follow.

Transdisciplinary

Environmental research projects can be regarded as having progressed to the transdisciplinary 'phase' if they involve researchers from related and unrelated disciplines, non-academic participants (for example user groups, land managers, governmental and non-governmental organizations, and the general public), or professional researchers operating as consultants outside academic institutions. In transdisciplinary research on the human environment or an environmental theme, such as industrial water pollution in area X or Y, academic research is supposed to be 'married' to first-hand experience and knowledge of the focus area under study (compare Van Eeden 2010a; Van Eeden 2010b). Two key justifications for undertaking this kind of participatory research are as follows (Gibbons and Limoges 1994, 153–7; Moran 2002; Klein *et al.* 2001, 35–44):

- it is more relevant to society than disciplinary efforts; and
- it provides a more holistic perspective on solving an environmental problem, or that requires remediation or improvement (Centre for Science Development 1997, 34).

There are numerous examples in the literature of 'transdisciplinary' research that should actually be labelled participatory because (unlike the prime focus in TD research) their intention is not to integrate different knowledge cultures to create new culture and theory, but to apply or develop research (Tress *et al.* 2004, 487–8). Gray conceptualizes transdisciplinary collaboration as innovation networks, underscoring the need for network stability, knowledge mobility and innovation appropriateness (Gray 2008, 204–8). The philosopher Mittelstrass (1993, 156) associates transdisciplinary with interdisciplinary in the sense that it helps to overcome the splintering of disciplines whenever these are in danger of losing their historical consciousness:

Transdisciplinarity does not merely leave the individual disciplines as they are, it reinstates the original unity of science, even if only within the context of particular solutions to particular problems. However, this unity is, again, the unity of scientific rationality ...

The 'father' of transdisciplinarity, physicist B. Nicolescu (2005, 7–8, 15), regards transdisciplinary research as complementary to disciplinary (and I

would like to add interdisciplinary) studies, although it is clearly distinct from disciplinary (and again I would like to add interdisciplinary) research. Among other things, he said:

The transdisciplinary education, founded on the transdisciplinary methodology, will allow us to establish links between persons, facts, images, representations, fields of knowledge and action, to discover the Eros of learning during our entire life and to build being in permanent questioning and permanent integration.

In an integrative multidisciplinary approach to environmental history, transdisciplinary research does best because it involves several disciplines (Phase 1, Fig. 1) and so can achieve true interdisciplinary status (Phase 2, Fig. 1). Henceforth the interdisciplinary approach I describe here is designed for a research environment that ends in transdisciplinary work but could result in a demand for additional disciplinary (Phase 1) and interdisciplinary (Phase 2) research.

Transdisciplinarity as an approach can be complex (Klein 2008, 116). It is therefore difficult to find a workable methodological pathway that could serve as the next point of departure in integrative multidisciplinary research in which environmental historians (other disciplines and expertise) can become involved (see Figure 1 for baseline suggestions — however, the detailed structures and discussions for project co-operations will vary from project to project).

What could the markers be to 'define' environmental history as interdisciplinary in nature?

From the concept of interdisciplinary within an integrative multidisciplinary research methodology, the following markers could serve as pointers to define environmental history as moving from the disciplinary (D) environment to become interdisciplinary in nature:

- Providing research space, for example, for History and other disciplines first to explore a research theme according to their own set of research questions, aims and methodological tools (also as an opportunity to contribute, among others, to disciplinary perspectives of a theme/determinant). See Figure 1, the D section.
- The involvement of environmental historians in projects, or/and the initiating of projects, including several related and unrelated academic disciplines (this involves exploring the potential and possibilities of crossing subject-related boundaries, for example, the humanities, the social sciences, the natural sciences and the health sciences) as well as academically qualified expertise in other professions. See Figure 1, the ID section.
- Deliberating on the disciplinary knowledge pool within a more interdisciplinary-focused research framework to progress towards developing a 'new' set of knowledge and theory to achieve a common research goal. This could and should involve the clustering of related disciplines in the ID phase to address one or more research questions in, for example, a second 'phase' report.

- To be open and willing to bring different epistemologies together (that is, to become immersed in one another's knowledge cultures, to understand the fundamental differences in their basic theories and axioms and to contribute to new knowledge and theory that will complement the community and scientific needs of the day).

Although a thorough transnational historiographical study is still due regarding the successes/failures of environmental historians in environmental history from an interdisciplinary angle, it can be stated without hesitation that environmental historians, for example in South Africa, have yet to cross the Rubicon of undertaking research projects that are interdisciplinary in nature as far as co-operation in the humanities and social sciences is concerned. Co-operation with related and non-related disciplines is more visible but is still limited (Van Eeden 2010b). Also hardly any environmental history contributions internationally have thus far resulted in a contribution of knowledge and theory that can claim to represent the interdisciplinary research approach. Reading between the lines of doing environmental history research, it is accepted that some environmental historians are making co-operative efforts towards a multi-disciplinary approach. This is mostly being done with the intention of contributing to new knowledge, but seldom with the desire to merge basic theories and axioms into a standard acceptable research methodology or/and a new set of theory: not that interdisciplinary co-operation should comply with all the conceptual criteria as outlined. The essence, however, is that no claim can be made that interdisciplinary research is the focus if it is done without an agreed methodological basis and a vision of eventually also establishing an understandable integrative methodology and theory that can serve as markers to determine trends and improve on research of this nature.

The question therefore is whether it is possible and feasible to introduce another research methodology if history shows that environmental historians are still grappling to find a way to master the interdisciplinary and even the transdisciplinary research methodology. My personal feeling is that, while no acceptable or specific methodology and theory has been cast in stone regarding the understanding of interdisciplinary research from an environmental historian's angle, more research options should be explored because research that involves expertise is not only conducted in an interdisciplinary or transdisciplinary way. As disciplines provide ample space for disciplinary research, historians, for example, should accept that these activities may find their way into interdisciplinary research and into the even more inclusive transdisciplinary research methodology. This should enable them to explore for themselves the most feasible way of carrying out research in environmental history that they are leading or participating in an integrative, multidisciplinary context (see Figure 1).

What it means to make environmental history transdisciplinary in nature

When the astrophysicist Erich Jantsch, the philosopher Jean Piaget, the mathematician André Lichnerowicz, and the quantum physicist Basarab Nicolescu united scientists (especially in the natural and the health

sciences) interested in the TD mode of doing research, they endorsed Piaget's impressions on transdisciplinary as a research methodology (Nicolescu 2007, 1–5):

Finally, we hope to see succeeding to the stage of interdisciplinary relations a superior stage, which should be 'transdisciplinary', i.e. which will not be limited to recognize the interactions and/or reciprocities between the specialized researches, but which will locate these links inside a total system without stable boundaries between the disciplines ...

To assist in the understanding of what it means to make environmental history transdisciplinary in nature, the following criteria serve as indicators:

- When research projects involve researchers from related as well as unrelated disciplines, including non-tertiary professionals and experts in their own right (for example, user groups, land managers, governmental and non-governmental organizations, informed members of the general public and professional researchers operating as consultants outside academic institutions) (compare Klein *et al.* 2001, 35–44).
- When research relates to more 'contemporary', hot-spotlike research, for example, on local environmental crises and other eco-health matters in which the focus serves as a platform to 'apply' research from a more holistic angle of problem solving. Research can also be done on issues that require a form of remediation or improvement through public policy or by applying practical solutions (compare Centre for Science Development 1997, 34).
- To some supporters of transdisciplinary research as 'participatory' research, the prime focus is not to integrate different knowledge cultures to create new culture and theory, but to *apply* or *develop* research (Tress *et al.* 2004, 487–8) with the aim of contributing towards finding solutions to maintain or to progress towards sustainable environments. To others, it is all about a permanent questioning and permanent integration of research opportunities to establish applicable links.

The complexity (Klein 2008, 116) of transdisciplinary as a methodology is a fact and is not debated. However, it is possible to explore methodological pathways to serve as a point of departure in research in which, for example, environmental (and even other) historians can become involved in (see Figure 1 as an example to serve this need and possibility).

Klein and colleagues suggested some evaluation principles and key insights as a framework for conducting research in, for example, TD-related fields (Klein *et al.* 2001, 81–93; Klein 2008, 118). Klein also outlined the various outcomes that might be obtained from research in a variety of co-operative disciplinary contexts (Klein 2008, 118–9)²:

- Feedback to multiple fields or disciplines
- Expanded expertise
- Expanded vocabularies
- Expanded toolsets
- The ability to work in more than one discipline
- A greater proclivity towards interdisciplinary and transdisciplinary collaboration

- A widened sphere of professional reading
- Forming of new formal affiliations
- The opportunity of co-mentoring postgraduate students.

The 'how' of TD research (Holmes *et al.* 2008, S182–92; Baumgärtner *et al.* 2008, 384–93) has paved the way internationally to valid questions in educational circles (Hagen 2008), such as how students perceive this kind of exposure to research and their training. Tress *et al.* (2008a) remark: 'PhD students want to integrate different fields of knowledge, but are not sure how to do this'. The question of 'how' in educational circles (and therefore also in research) is still valid and remains to be answered.

The TD research approach is quite familiar, particularly to historians who focus on environmental, regional, or local history research. A community's history, for example, cannot be properly recorded if the community itself is not involved in the process by contributing memories and primary resource materials not available elsewhere, etc. A first form of TD-related research is relevant to, for example, environmental historical research already in the 'D-phase' of research, namely that:

- Communities, individuals, groups, research consultants and higher education and training (HET) academics exchange research information, disciplinary knowledge or experiences regarding a specific environment. The historian, for example, then simply uses this information according to the historical research methodology and writing process with no direct involvement in a research report. Contributors will only be acknowledged in the references section of a report (see Figure 1, the 'D' section).

A second form of TD-related research occurs in the 'ID-phase' when all the disciplines, clustered according to their relatedness, address a research question(s) which includes involving communities, individuals, groups, research consultants and HET academics (see Figure 1: the 'ID' section).

A third form of TD-associated research in environmental related history should actually happen in a TD-phase of research in which communities, individuals, groups, research consultants and HET academics not only exchange research information, disciplinary knowledge or/and experiences, but also progress in the research approach by continuing a relation of participating as full partners in a research project. For example, together with other disciplines, the environmental historian will participate in both the research and the report writing as a full partner in a research project. The specific research project also functions according to research criteria and a methodology that all participants have already agreed upon in the ID phase. In the TD phase, it is expected that the selected contributors from other professions and informed community members outside the academic environment will feature as knowledgeable partners to support the completion of the 'phase 3' of research and reporting (see Figure 1: the 'TD' section).

To be able to achieve the ideal of integrative environmental history research that features skill, depth and wisdom, it should be cooperatively conducted by disciplinary specific expertise. This does not always appear to be the case because in various applied sciences in which interdisciplinary research is

carried out, the research sometimes overlaps the domains of other disciplines which would have been better positioned to provide insight into research of an interdisciplinary and transdisciplinary nature. In an integrative multidisciplinary research approach, the ideal is also to address this shortcoming in obtaining research knowledge from a wider and more in-depth contextual understanding by explicitly departing from a disciplinary angle towards an ID and eventually TD environmental history-related research as briefly explained in Figure 1.

What it means to progress towards referring to environmental history as integrative multidisciplinary (IMD) in nature

Integrative research is not new in the scientific literature (Jemison 1981, 601–8; Christie *et al.* 2005, 468–83; Tress *et al.* 2004, 479–93), and integrative multidisciplinary research has also been explored to some extent in the environmental and the health sciences (Janssen and Goldsworthy 1996, 259–79; Nelson *et al.* 2002, 499–520; Rosenfield 1992, 1343–57). The experience and knowledge from these studies (some of which rely on research done in specific regions or localities) would certainly be useful for consolidating thinking about IMD research in the humanities and the social sciences in which environmentally related history also features. However, no specific IMD research methodology exists that connects to research in the humanities or the social sciences by historians or other disciplinary experts. To consider such an approach, a group of experts in South Africa at North-West University from a range of disciplines, especially the human and social sciences, decided in 2010 to launch a local environmental history pilot study. Although the outcome of their findings will only be fully disseminated by December 2011, some stimulating ideas about other ways of thinking about IMD research for consideration now and in the future are discussed in next sections.

To understand IMD research in the context of this discussion, the ideal in research is to use as a point of departure the contribution of discipline-specific expertise in related sciences (in the humanities and social sciences which are basic or applied) and unrelated sciences (that focus on environmental and other eco-health research). If research, for example in an environmental history theme (a field which is not only the domain of History as discipline but a field of research that could utilize historians better), could start from a disciplinary foundation to progress eventually to an acceptable ID and TD research ‘phase’ as briefly outlined in previous sections (see also Figure 1), the research would then have reached an IMD level that should deliver quality insights into the research project matter (Van Eeden 2011).

Environmental history and local environmental historians on research of a multidisciplinary nature

Although research by environmental historians has in many ways expanded to being or being regarded as interdisciplinary, Michael Lewis (2005, 53–5) has deliberated as follows on the status of environmental history practice:

... I can suggest three paths we might continue to explore — for none of these ideas are novel, but neither are they the dominant trend in our discipline at the moment: We must think more globally, embrace interdisciplinary work, and we must write more synthetic

histories. If we succeed in doing so, I suspect that we will continue in the grandest tradition of our predecessors as transformative influences within the larger historical discipline, and we will minimize the risk of environmental history becoming an increasingly specialized and inward-looking sub-field with our own language, our own arguments, and our own (limited) audience ... All of us who have worked in environmental studies believe that understanding environmental change requires the insights of multiple disciplines. Insofar as we aspire to write histories that recognize that same complexity in the past, we must begin to learn more biology, more economics, more sociology, more philosophy ...

It is in so-called area studies (Ritvo 2005, 75–6) that opportunities for crossing disciplinary boundaries and an examination and intellectual collaboration of transnational aspects within regional studies became prominent (Grafton *et al.* 2005, 1–220).¹ The quest for proper training to accommodate new integrative research trends is repeatedly pursued. In 2004, Katz remarked: ‘As historians become increasingly spatial in their analysis, area studies theorists and programs may be helpful partners, while history departments can offer area studies programs, many of which have historical foundations, [as] historical training for their students. And, like history, many area studies programs are moving toward the humanistic disciplines’ (De Steiguer 2006, 202; Committee on Graduate Education of the American Historical Association. 2004). In multidisciplinary studies, the intention should always be to embrace one’s academic roots and to accommodate their research tools in, for example, a transdisciplinary research environment. Ignorance leads nowhere (Pyne 2005, 72–4; Sabin 2010, 76–93).

An icon of South African history practice, F. A. van Jaarsveld (1979, 14–8; 1989, 95–9) supported disciplinary co-operation between history and other disciplines in the 1970s as an addition to the development of history’s expanding focus and fields of research. The then emerging field of local history in South Africa (Eloff 1991, 12), for example, paved the way for history researchers to become more aware of regional social trends that allow closer interdisciplinary and even transdisciplinary research opportunities because of the varieties of knowledge and insight required to conduct quality research in local history, which also includes environmental issues.

From the late 1970s to the early 1980s, local history research developed alongside the methodological ideas constructed by the History Workshop Group of the University of the Witwatersrand (Wits University). In essence, the research approach by this group was to emphasize history from below, which means that the role and input and knowledge of communities in certain environments and/or activities should be acknowledged in the scientific research process. In many ways, this is partly what transdisciplinary research is all about when practiced within disciplinary and interdisciplinary contexts, with some additional thinking and distinctions attached to the research from a wider perspective such as the TD research approach (Figure 1).

Historians, archaeologists, educators, political scientists, geographers and sociologists were key professionals associated with the academic activities of the Wits History Workshop Group (Smith 1988, 165–7, 185–7; Van Eeden 2006). Views on contemporary TD research methodologies could therefore, to a greater or lesser extent, certainly be associated with some of the

historiographical trends (whether it was purely environmentally focused or related to human contextual environmental research) that South African historians (and others internationally) had been exposed to for decades.

In environmental history research, the TD approach also became readily applicable to this field of research because of inevitable connections with communities, their experiences and the wealth of oral history. The many voices, debates and differences in statistical data, together with intellectuals' thinking and debating on environmental ethics, justice, human and legal rights, environmental crime and hydrosolidarity (Jacobs 2003; Van Eeden 2008a), allow environmental history research to be practised from a broader TD angle (as suggested in Figure 1). At least in South Africa, Carruthers noted that: 'there is ... an overall absence of active collaboration between historians and other disciplines' in the human and social sciences who also at least make use of chronology in their research methodology (Carruthers 2006b, 5; Dovers 2000, 130–52).

The 'Triangular Model' in Figure 1 suggests some broad research phases and criteria with which to approach and conduct IMD research, and so progress with IMD research up to a transdisciplinary 'phase'. It is important to note that, in the context of this model in IMD research, no interdisciplinary or transdisciplinary research in environmental history is possible without the backing of sufficient fundamental research by discipline-specific experts on the research theme.

A 'triangular model' for conducting and reporting research in disciplinary, ID- and TD-focused environmental history (as IMD structured research)

Historians are equipped to deal with interdisciplinary research and a broader scope of transdisciplinary research without forgetting or ignoring their valuable historical roots. Regional and local history (compare Van Eeden 1992, xx) deals with various themes in which human involvement and interaction with the environment are accentuated. It must be possible to break a research theme down into its smallest components and to find relevant information about each of the relics or pieces of data uncovered (whether they are in an archive, in fieldwork or in the laboratory), and to bring them together into a coherent whole so that broader views can be exchanged and meaningful solutions found. Environmental historians should therefore not avoid interdisciplinary research possibilities, especially those that are progressing towards being inclusive of transdisciplinary.

History's wide research field and knowledge at all levels of community actually allow the discipline to take the lead in research processes of an interdisciplinary and transdisciplinary nature within the humanities, as well as among other related and non-related sciences. For example, I believe that environmental research projects, in which crises (slow or fast) feature and in which environmental historians also feature prominently in supporting research to solve problems (Van Eeden 2010b), should always be approached triangularly. This is referred to as multidisciplinary research, but multidisciplinary here has a totally new meaning and context: it progresses in an integrative way in 'phases' of research from the disciplinary through the

interdisciplinary, and involves a phase to accommodate the transdisciplinary research approach (see Figure 1). Themes related to environmental crises and national eco-health issues, for example, could be associated with or feed into global environmental trends (compare Wallerstein, in: Hornborg *et al.* 2007, 382). For a discussion on an IMD approach to environmental history, see Figure 1.

The way forward

In this discussion, some broad impressions were provided on disciplinary, interdisciplinary and transdisciplinary research as combined approaches in environmental history. The value of this theme is that it falls mainly within the scope of a local environmental historian's efforts to understand trends in broader research methodologies, how these concepts differ, and how they can be used in research that aims at being integrative in order to provide information that efficiently serves science and the community. The present and future role of disciplinary research in the humanities necessarily emerges in a debate of this nature. Environmental historians could play a decisive role in developing opportunities for an integrative research environment by reconsidering research methodology. Environmental history research, especially in the transdisciplinary methodology 'phase' requires challenges of thinking 'out of the box'. A broad repertoire of knowledge and wisdom is expected. The focus should not only be on expanding the historiography and the theory of the discipline (and of other disciplines), but on supporting contributions to strengthen community knowledge and expertise on environmental issues of concern to all to ensure sustainable consideration of environmental matters.

Clear conceptual frameworks and improving methodologies within the process of transdisciplinary research could and should eventually lead to the accommodation of a new level of education and research opportunities (Tress *et al.* 2008b, 148–9).

How this approach as suggested in Figure 1 can be accommodated in an integrative disciplinary manner, should also be debated by the humanities and the social sciences. Without these efforts, and without the humanities becoming actively involved in (and even leading) research undertakings of an IMD nature, this important part of environmental history research will remain in isolation. Research in isolation may perhaps serve a community only in the short or perhaps the long term, but will not result in any theory or long term research frameworks (compare Burke 2005, 189). Research frameworks are also necessary for reconsidering and developing new training pathways that may be more career focused, more focused towards day-to-day environmental concerns and even more challenging towards establishing research that serves communities more sustainability.

Notes

¹ This collection of essays is by multiple researchers at the Centre for Resource and Environmental Studies, Australia, regarded as the Southern Hemisphere's biggest and oldest interdisciplinary environmental research centre.

² The findings of Klein have been confirmed by Professor J. W. N. Templehoff thorough oral discussion, Januray 2010).

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