STAND-ALONE PROJECT

FINAL REPORT

Project number	P 25796-G18
Project title[1]	**Vienna´s Urban Waterscape 1683-1918. An Environmental History / Umweltgeschichte der Wiener Gewässerlandschaft 1683-1918 Acronym: URBWATER**
Project leader	**Univ. Prof. Dr. Verena Winiwarter**
Project website[2]	**http://www.umweltgeschichte.aau.at/index,6536,URBWATER.html**

1 Short title in English and German language
2 Projects that started after January 1, 2009 are encouraged to have a website.

I. Summaries for public relations work

URBWATER analysierte die Wiener Gewässerlandschaft zwischen 1683 und 1918 mit einem Fokus auf den kleinen Donauzubringern. Damit bildete diese Studie eine räumliche Erweiterung des Vorgängerprojekts ENVIEDAN („Umweltgeschichte der Wiener Donau 1500 – 1890“). Untersucht wurde, warum und wie städtische Gewässer verändert wurden und wie deren gesellschaftliche Nutzungen und Eingriffe den bebauten Stadtraum sowie die Interaktion zwischen StadtbewohnerInnen und Gewässern beeinflussten. Die Bearbeitung durch ein interdisziplinäres Team aus den Fächern Umweltgeschichte, Stadtmorphologie, Flussmorphologie und Umweltwissenschaften zeigte, wie sehr umwelthistorische Forschung von der Kooperation von Geistes- und Naturwissenschaften profitieren kann. Das Konzept der sozio-naturalen Schauplätze und ein in ENVIEDAN entwickeltes Gewässer-Stadt Interaktionsmodell dienten als theoretische Basis. In URBWATER wurden die Analysen von ENVIEDAN nicht nur fortgesetzt, sondern auch methodisch erweitert, vor allem im Hinblick auf räumliche Analysen.

Die materielle und energetische Nutzung der Gewässer wurde ebenso untersucht wie die hydromorphologischen Eigenschaften und Prozesse sowie deren stadtmorphologische Effekte und Wechselwirkungen. In einer Projektsynthese wurden die komplexen Interaktionen integriert. Die Projektergebnisse zeigen, dass die Vielfalt der urbanen Gewässer die Stadtentwicklung groß- und kleinräumig ebenso beeinflusste wie die Art und Technik der Wassernutzung. Die stadtweite Analyse der Mühlenlandschaft machte deutlich, dass die Wasserkraftnutzung an die Diversität der Gewässer angepasst und die Abstimmung mit anderen Nutzungen unerlässlich war. Bis in die 1870er-Jahre, als die erste stadtweite Wasserleitung aus dem Alpenraum eröffnet wurde, spielte Grundwasser sowohl als Trinkwasser- als auch als Brauchwasserressource eine große Rolle. Wasserabhängige Gewerbe wie Schlachter, Gerber, Färber, Textildruckereien, Bierbrauer oder chemische Betriebe lagen nur teilweise an Gewässern, die vor allem als Abfall- und Abwassersenken dienten. Die kleinen Bäche mit ihrer extremen Hydrologie beherbergten kaum größere Fischbestände. Für die lokale und regionale Fischversorgung waren bis in die späten 1890er vor allem die Donau und Karpfen aus böhmischen Teichen relevant.

Ergebnisse von URBWATER wurden bis dato in neun begutachteten Zeitschriften- und Buchartikeln und in 18 weiteren Artikeln und Buchkapiteln veröffentlicht oder akzeptiert. Ein Hauptprodukt ist ein Themenheft der Zeitschrift „Water History“. URBWATER wurde auf internationalen und nationalen Konferenzen und Workshops in insgesamt 28 Vorträgen präsentiert. Artikel und Interviews in Zeitungen und Radiosendungen sowie eine Ausstellung im Wiener Stadt- und Landesarchiv machten Projektergebnisse einer breiteren Öffentlichkeit bekannt.

URBWATER investigated the Viennese waterscape between 1683 and 1918. The project focused on the small tributaries of the Viennese Danube, thereby complementing the investigations of the precursor project ENVIEDAN (“Environmental History of the Viennese Danube 1500-1890”). The project aimed at enhancing our understanding why and how the urban network of surface waters was transformed and how this changed urban space as well as interactions of urban actors with their waters. URBWATER was performed by an interdisciplinary team of environmental historians, urban morphologists, hydro-morphologists and environmental scientists and showed, how environmental history studies benefit from the cooperation of scholars from the humanities and sciences. The project used the concept of socio-natural sites and a conceptual model of river-city interactions developed in ENVIEDAN. URBWATER continued the methodological advances of ENVIEDAN, especially the spatial analyses.

The research team investigated the material and energetic uses of urban waters as well as hydromorphological characteristics and processes and the interplay with urban form. The project synthesis integrated the complex interactions. Our results show the large diversity of surface waters and groundwater resources and their impact on urban development as well as on the types and means of water use. For instance, the city-wide study of the milling landscape demonstrated that adapting to natural dynamics of streams was decisive for hydropower use. Harmonisation with other often conflicting water uses was also a prerequisite. Groundwater played a large role for both drinking and process water until the 1870s, when the first city-wide water pipeline supplied from Alpine springs was opened. Water-dependent crafts such as slaughtering, tanning, dyeing, textile printing, beer-brewing and chemical industry were not solely located at the rivers, which functioned mainly as waste- and wastewater discharge. The small size and specific hydrology of urban streams limited fish productivity. Local and regional fish were delivered from the Danube or from Bohemian carp ponds until the late 1890s.

To date, results of URBWATER are published or accepted in nine peer-reviewed journal and book articles and 18 other articles and book chapters. A thematic issue of the International Journal of Water History is a main product. URBWATER was presented at several international and national scientific conferences and workshops (altogether 28 presentations). A larger public was informed by various articles and interviews in newspapers, journals and on national radio programs and in particular by an exhibition organized at Wiener Stadt- und Landesarchiv from September 2015 to February 2016.

II. Brief project report

1. Report on research work

1.1 Information on the development of the research project

URBWATER investigated the Viennese waterscape between 1683 and 1918. The project focused on the small tributaries of the Viennese Danube, thereby enlarging existing knowledge and complementing the investigations of the precursor project ENVIEDAN (Environmental History of the Viennese Danube 1500-1890). In four thematic work-packages, URBWATER analysed stream morphology, urban morphology and space as well as material and energetic uses of water. In the project synthesis the results were integrated. The project aimed at enhancing our understanding why and how the urban network of surface waters was transformed and how this changed urban space as well as interaction of urban actors with their waters. Research was done by an interdisciplinary team of environmental historians, urban morphologists, hydro-morphologists and environmental scientists. The project built on the concept of socio-natural sites and a conceptual model of river-city interaction developed in ENVIEDAN. In methodological terms, URBWATER continued spatially explicit historical analyses initiated in ENVIEDAN. All spatially explicit results were incorporated into a joint GIS-platform.

There was no fundamental change of the original project plan. But due to the budget cut, the allocation of resources to the different themes was reconsidered at the beginning of the project. Main criteria for the decision were the linkages between the different tasks as well as existing knowledge. Since transport and navigation was least related to other topics and several studies already exist, it was decided to reduce this task in order to ensure that all other work could be done in sufficient detail. One subtask of work package “transport and navigation”, i.e. the investigation of “Wiener Neustädter Schifffahrtskanal”, was integrated into the analyses of urban morphology and energy use of urban waters.

1.2 Most important results and brief description of their significance (main points)

URBWATER confirmed that environmental histories benefit from the interdisciplinary cooperation of humanities and sciences. Combining the expertise from different scientific fields was indispensable e.g. to understand, which role natural features of surface waters and groundwater played for the development of urban space and the history of water uses. The project also improved the methods for spatial analyses in environmental history using digital tools (AutoCAD, GIS), thereby making the field more relevant for the planning disciplines.

- *Spatial development of urban areas, dynamic of surface waters and groundwater*

URBWATER investigated the variegated urban waterscape that ranges from mountainous lotic streams, creeks of the hill country, and meandering lowland rivers to the Danube River. The hydro-geological configuration determines the location and typology of waters. Most streams exhibit a significantly variable flow regime; in addition to seasonality, droughts and flash floods after heavy local rainfalls were typical phenomena. Urban dwellers decided if and how to use these waters by judging the natural features and the location of them. Flashy regimes significantly restricted human uses. Mill operation was interrupted by droughts and floods. Such conditions characterised even Wien River, the largest Viennese Danube tributary (see fig. 1). Until the 1870s, groundwater was the most important source for drinking

and partly also for process water. A scarcity of groundwater, as on the steppe-like hills in the south of the city made conditions unfavourable for settlements.

Regularly occurring flood damages led urban authorities and riparian land owners to initiate river engineering measures prior to the 17th century. The closer to the city centre, the earlier river regulations began, but the expansion of urban settlement required vaulting of stream sections already in the 18th century. Mill operation depended on weirs, mill streams and embankments. Most of these and other hydraulic structures had to be reconditioned regularly, sometimes each year due to fluvial dynamics. After the integration of the tributaries into the sewage system in the second half of the 19th century, most streams and creeks were no longer visible on the surface (Hauer et al., accepted; Hohensinner, 2016; Hohensinner & Hahmann, 2015).

Fig. 1: Wien River - the largest tributary of the Viennese Danube – in 1755, view from east (reconstruction Severin Hohensinner & Julian Reichstein, 2016)

- *Small scale studies of urban morphology and the location of streams*

A compound study of fluvial and urban form in four selected areas has been undertaken to trace the co-evolution of the city's built fabric with its surface waters (see fig. 2 for Erdberger Mais as example; Hauer et al., accepted). The structural permanence of different types of waters between the 17th and the 20th centuries, a period of massive urban transformation, was investigated. Urban expansion into Vienna's floodplains was explored on a general level (Hauer, 2016) and in a detailed case study (Hauer & Hohensinner, submitted), partly drawing on material and insights from the precursor project ENVIEDAN (e.g. Haidvogl et al 2013, Water History).

Societal needs and responses to fluvial dynamic changed over time. They affected different scales and materialized in urban structures on all spatial levels. The study of the material

effects, side-effects and afterlives of socio-natural processes offered novel perspectives to environmental history and to urban morphology alike. Long-term studies are vital in understanding the genesis of urban waters and urban form as a product of such socio-natural processes. They show the inertia of arrangements and the unforeseen perpetuation of site-specific interventions. Societal interaction with natural elements such as Vienna's waters reverberates in the material and immaterial realm. This approach also contributed significantly to other investigations performed in URBWATER.

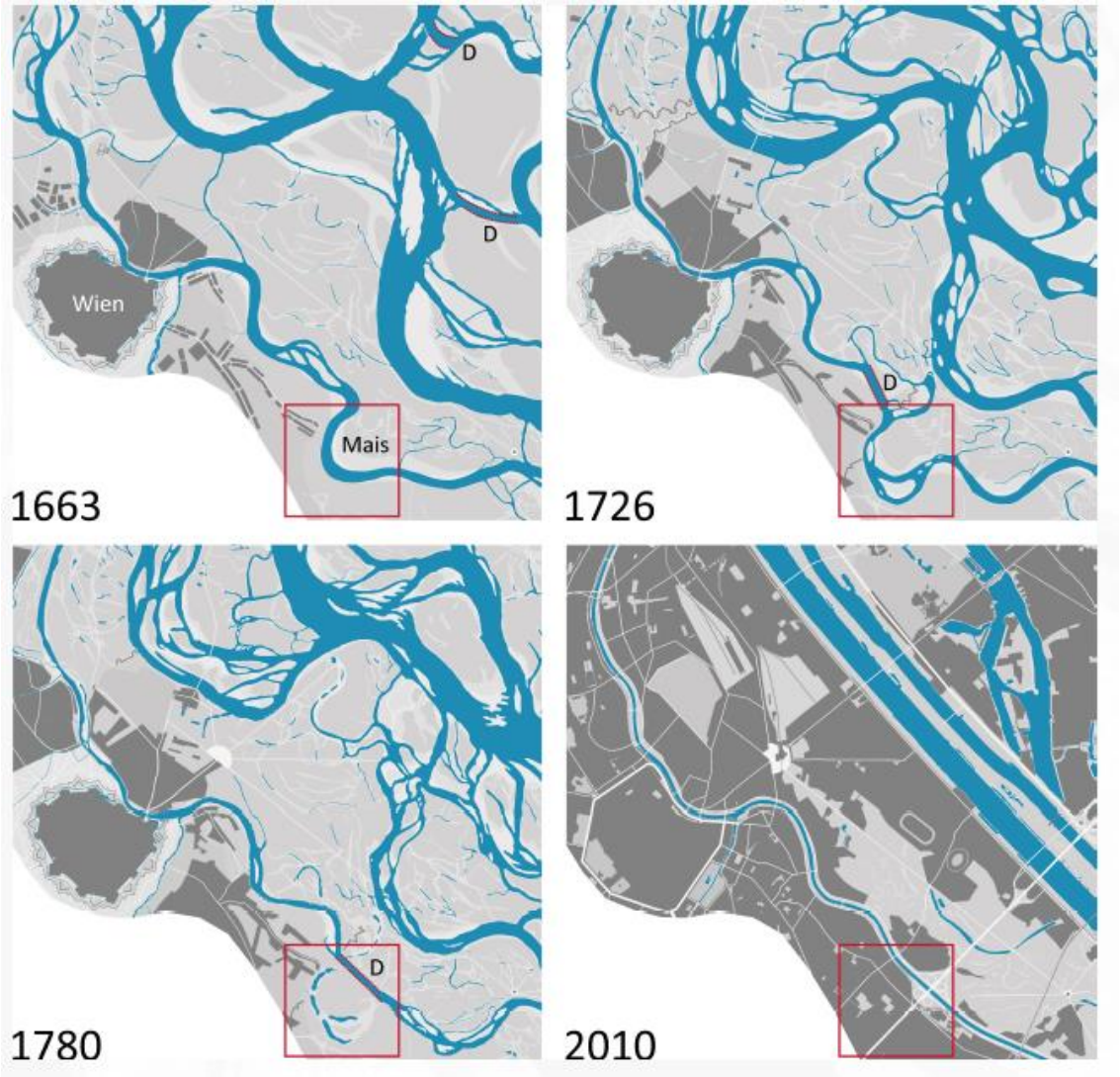

Fig. 2: "Erdberger Mais": Along a former meander of Donaukanal traces of the water course were visible for more than two centuries before recent urban development erased them (reconstruction: Friedrich Hauer und Severin Hohensinner)

- *Natural dynamics and energetic uses of Viennese Danube tributaries*

In URBWATER a city-wide study of urban hydropower use on diverse streams was performed. The combination of maps and written sources (e.g. registers, chronicles) enabled the team to draw a comprehensive picture of Vienna´s milling landscape between 1661 and 1918. Urban hydropower use required a complex infrastructure beyond the mill-building (see example in fig. 3). Boat mills on the Danube also played an important role. Using GIS, the spatial distribution of mills on different rivers and river types and their development pathways were studied.

Most sites allowing the erection of a mill on urban waters were already in use at the beginning of the research period. In the following centuries, their number decreased in the immediate urban area due to sanitary concerns and conflicts over water use e.g. for water pipelines. In the periphery, the number of mills increased slightly and in the 19th century, a consolidation of grain mills and transformation of mills into factories took place. Increasing demand for flour of the growing population in the 19th century is reflected in particular in the number of boat mills on the Viennese Danube (Spitzbart-Glasl, 2016). Conflicts and cooperation between users were analysed as well as the structural permanence of mills in the urban fabric despite their vulnerability towards floods (Hauer et al., accepted). The "Wienflussaufnahme" from the 1850s by Prof. Josef Stummer (Wiener Stadt- und Landesarchiv, WStLA) enabled studying the role of energetic use vis-à-vis the diversity of other river uses (Spitzbart-Glasl & Pollack, in print).

- *Spatial analysis of commercial water use and organic effluents*

The role of urban streams for supplying water to crafts and industries and for wastewater discharge in the late 18th and in the 19th centuries was studied for the Wien River (Pollack et al., accepted). This urban stream was a centre of production during industrialization. Animal slaughtering, tanning, dyeing, textile printing, beer brewing, and chemical industry as main water-using and -polluting crafts were investigated. Spatial distribution patterns of these industries from the end of the 18th to the end of the 19th century show a more complex picture than initially anticipated. Distinct patterns for different sections of the river and for different crafts were observed as well as a change over time. Throughout the study period, the locations of crafts expanded upstream resulting in growing distances from the city centre. In the late 19th century, existing factories were enlarged or newly built along the stream in particular in the rural outskirts (e.g. Hütteldorfer brewery, see fig. 3). Only few types of businesses were situated close to the river banks. This can to some extent be explained with the high risk of flooding. Groundwater played an important role for water supply, while the main function of the river was wastewater discharge.

Based on existing studies for Paris and the Seine (Billen et al. 1999, the Science of the Total Environment) nitrogen released by all Viennese tanners was calculated for the middle of the 19th century, when Vienna's population amounted to 630.000 people. Tanners alone polluted urban waters with an equivalent of 46.737 inhabitants (Slavicek 2016).

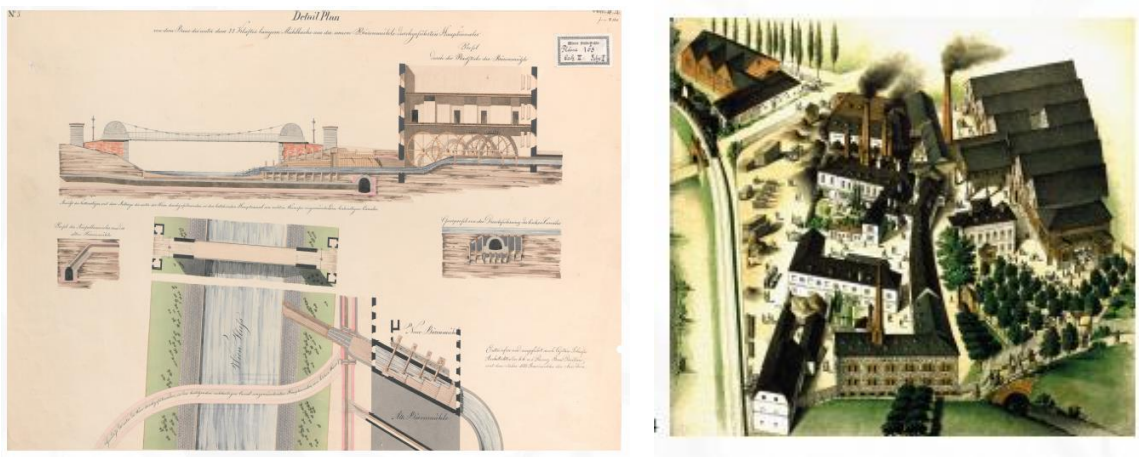

Fig. 3: Water was abstracted from Wien river to operate mills erected on mill canals (example of "Bärenmühle", drawing from 1831/32; picture on the left); the Hütteldorf brewery built in the rural section of Wien River in the late 16th century contributed in the late 19th century considerably to river pollution together with many other urban crafts (picture on the right).

- *Urban waters as source of fish*

Viennese Danube tributaries played a minor role for urban fish supply. Reports on fisheries and pictorial sources exist e.g. for Wien River or Alserbach. The specific hydrology and the regular drying up of the river beds during summer harmed fish stocks. In the 19th century, growing pollution diminished fish populations. The main river for fish supply was the Danube in and around the city. But without Bohemian aquaculture, supply of a sufficient amount of fish would have been impossible. Fish market data from 1880-1914 were used to investigate the role of local and regional resources and their changes. The first systematic channelization of the Danube accomplished in Austria changed the fish composition and subsequently fish species consumed. Local fish resources declined parallel to the regulation of the Danube. The amount of fish sold at the urban fish market increased from about 600 tons in the 1880s to about 2250 tons in the 1910s. This increase was only possible because better and faster transport means enabled the import of marine fish from the North Sea (see Gruber 2015, Haidvogl et al. 2015).

- *Conclusions and new hypotheses developed*

The study of Vienna and the city´s Danube tributaries showed the importance of urban waters for the transition period towards an industrialized metropolis in the beginning of the 20th century. It can be concluded that

- In the pre-industrial period, river uses and urban development were adapted to the diversity of waters (different types of surface waters and groundwater)
- By the beginning of the 20th century, multifunctional streams had often been transformed into mono-functional arrangements;
- Urban waters partly exhibited persistence and are still partially visible in urban morphology;
- River engineering measures on tributaries started before the end of the 17th century, especially close to the city centre;

Results of URBWATER will contribute to a new research project proposal on urban flood risk, flood protection and vulnerability in Vienna (submitted to FWF in July 2016). Some hypotheses of this proposal build directly on knowledge gained from URBWATER. For instance, it is now clear that human interventions into rivers and their floodplains had an important bearing on floods in the 18th century. Anthropogenically influenced floods triggered new interventions, thereby changing vulnerabilities, risks and resilience. A main source to investigate these patterns and processes is the “Wienflussaufnahme” from J. Stummer. Its potential for environmental history studies will be acknowledged for the first time.

1.3 Information on the execution of the project, use of available funds and (where appropriate) any changes to the original project plan

URBWATER was scheduled for 24 months from Oct. 1, 2013 to Sept. 30, 2015. Due to leaves of absence and research visits abroad of PhD-students, a cost-neutral project extension until Jan. 31, 2016 was requested and accepted by FWF.

The project involved Verena Winiwarter, full professor of environmental history, as project leader and supervisor of the two PhD-theses of Gudrun Pollack and Christina Spitzbart-Glasl (Alpen-Adria-Universität Klagenfurt; AAU). Fridolin Krausmann, full professor of social ecology at AAU, supervised the PhD of Sylvia Gierlinger in social ecology. Erich Raith, associate professor of urban morphology at Vienna University of Technology (TU), contributed his scientific expertise and acted as supervisor of the PhD-thesis of Friedrich

Hauer. Two Post-Doc researchers from University of Natural Resources and Life Sciences, Vienna (BOKU), Gertrud Haidvogl and Severin Hohensinner, investigated the fluvial morphology of urban waters and groundwater and their role for commerce including its spatial distribution.

Four PhD-students were involved. One PhD-thesis in social ecology (Sylvia Gierlinger) started already in the precursor project ENVIEDAN. Christina Spitzbart and Gudrun Pollack initiated in URBWATER their PhD projects in environmental history. Friedrich Hauer began working on his PhD in urban morphology. Nine master theses focused on specific topics related to the main research questions. Five of them are completed, four will be finished in the next months (see annex). Ulrich Felkel and Anna Hagen supported work at BOKU and TU. Gert Dressel accompanied the project as facilitator of interdisciplinary cooperation.

No large equipment was needed and purchased for the execution of the project.

There were no significant deviations from the original project plan except those reported above.

2. Personnel development – Importance of the project for the research careers of those involved

Verena Winiwarter strengthened her expertise in the environmental history of urban waters and the international visibility of her research projects. URBWATER contributed to strategic goals of her professorship, namely to prepare an environmental history of Austria and to promote long-term socio-ecological studies of the Danube. Sylvia Gierlinger improved her expertise in urban metabolism studies and water pollution. She completed two peer-reviewed papers as main author and will finish her PhD in summer 2016. Friedrich Hauer produced significant results for his PhD-thesis in urban morphology (due 2017) and broadened his expertise in investigating urban transformation phenomena. Working with 18th and 19th century source material as well as with hydromorphological GIS-integrated datasets strengthened his methodological skills and considerably enhanced his interdisciplinary scientific profile. Christina Spitzbart-Glasl gained new insights on the environmental history of hydropower use by extending her research focus to the period of the 17th to the 20th centuries. She expanded her skills in working with archival sources. She finished two manuscripts for an edited book and a journal and lay the foundation for a peer reviewed paper. Gudrun Pollack continued her studies on the environmental history of Wien River which she began during her master thesis. She finished one Working Paper and one peer-reviewed article on this urban river as contributions to her PhD-thesis. Gertrud Haidvogl complemented her expertise in the environmental history of rivers through her work on the role of water supply and pollution. Severin Hohensinner expanded his knowledge in historical fluvial morphology and his skills in using historical sources for reconstructing past riverscapes. He continued his GIS-analysis on the spatial development and transformation of the Viennese waterscape.

3. Effects of the project beyond the scientific field

A milestone for making available project results to a wider public was an exhibition organized at Wiener Stadt- und Landesarchiv from September 2015 to February 2016. Results of URBWATER were also communicated to a wider public by means of articles and interviews in national Austrian newspapers and journals (e.g. Die Presse, Standard, Universum Magazin) and national radio programmes. A project webpage was produced (see annex).

4. Other important aspects

During the project two international workshops were organized. The workshop “Comparing urban rivers” was held in Vienna in October 2014, involving colleagues presenting Lyon, Brussels and Munich. A special issue of Water History has been prepared from the contributions (see annex). A second workshop was held in Vienna in April 2015 with the project´s Advisory Board.

To date, results of URBWATER are published or accepted in nine peer-reviewed journal and book articles and 18 other articles and book chapters. Five master thesis have been completed, four will be finished in the next months. Further publications are in preparation. Project results were presented at several international and national scientific conferences and workshops (altogether 28 presentations) and integrated into university lectures and seminars of the project team at all three universities. Especially the PhD-students were involved in these lectures and seminars (see annex). Friedrich Hauer, for instance, organized two specific seminars on urban waters at TU Vienna. A full list of presentations, conference panels and organized seminars is provided in the annex.

III. Attachments

(lists may be as long as required)

1. Scholarly / scientific publications

1.1 Peer-reviewed publications / already published (journals, monographs, anthologies, contributions to anthologies, proceedings, research data, etc.)

Published or in print

1. Gierlinger S. (2015): Food and feed supply and waste disposal in the industrialising city of Vienna (1830-1913). A special focus on urban nitrogen flows. Regional Environmental Change 15, 317-327. http://link.springer.com/article/10.1007/s10113-014-0653-5, Hybrid OA.
2. Gierlinger S., Hauer F., Pollack G. & Krausmann F. (in print): Metabolism and waterscape in an industrialising city. A quantitative assessment of resource use and its relation to the transformation of the urban waterscape in 19th century Vienna. Agua y Territorio. Gold OA
3. Neundlinger M., Gierlinger S., Pollack G. & Krausmann F. (2014): An Environmental History of the Viennese Sanitation System—From Roman to Modern Times. Tvedt T. & Oestigaard T. (eds): A History of Water: Water and Urbanization. Series III, Vol 1. I.B. Tauris, London. ISBN 1780764472, 325-350. No OA (not offered for this edited volume)
4. Spitzbart-Glasl Ch. & Pollack G. (in print): Competition in transition. An exploration of water and land use in the Wien River valley through the eyes of mid-19th century engineers. Niewöhner J., Bruns A., Hostert P., Krüger T., Nielsen J. Ø., Haberl H., Lauk C., Lutz J. & Müller D. (eds): Land Use Competition. Ecological, Economic and Social Perspectives. Springer, Berlin, Heidelberg. ISBN: 978-3-319-33626-8. No OA (not offered for this edited volume).

Accepted or in review

5. Gierlinger S. (in review): Water and blood: Animal slaughtering and processing of blood in the industrializing city of Vienna. Journal of Urban History.
6. Hauer F., Spitzbart Ch. & Hohensinner S. (accepted): How water and its use shaped Vienna´s spatial development. Water History.
7. Pollack G., Gierlinger S., Haidvogl G. & Winiwarter V. (accepted): Using and abusing a torrential urban river. The Wien River before and during industrialization. Water History.
8. Winiwarter V., Haidvogl G. & Bürkner M. (accepted): The Rise and Fall of Munich's Early Modern Water Network: A Tale of Prowess and Power. Water History.
9. Winiwarter V., Haidvogl G., Hohensinner S., Hauer F. & Bürkner M. (accepted): The long-term evolution of urban waters and their 19th century transformation in European cities. A comparative environmental history. Water History.

PhD-thesis

10. Gierlinger S. (2016): Metabolism and Waterscape. Flows of Nitrogen and Water in the Industrialising City of Vienna. PhD-thesis. Alpen-Adria Universität Klagenfurt, Austria.

1.2 Non peer-reviewed publications / already published (journals, monographs, anthologies, contributions to anthologies, research reports, working papers / preprints, proceedings, research data, etc.)

Published

1. Gierlinger S. (2016): Wien und die Schwemmkanalisation. Szabó C. & Tamáska M. (eds): Donau – Stadt – Landschaften II, Publikationen der ungarischen Geschichtsforschung in Wien. LitVerlag Dr. W. Hopf, Berlin, ISBN 978-3-643-90767-7; 279-286.
2. Haidvogl G., Gruber Ch. & Pont D. (2015): Using historical fish market data (1880-1914) to reconstruct fish composition changes of the Austrian Danube at the turn from the 19th to the 20th century. ZABR-GRAIE (ed): i.s. rivers, Integrative sciences and sustainable development of rivers, June 22-26, 2015, Lyon, France, Conference-Proceedings, 84.
3. Hauer F. (2016): Wien und die Donau(auen): zur Entstehung einer Stadtlandschaft. Szabó C. & Tamáska M. (eds): Donau – Stadt – Landschaften II, Publikationen der Ungarischen Geschichtsforschung in Wien. LitVerlag Dr. W. Hopf, Berlin, ISBN 978-3-643-90767-7; 121.134.
4. Hohensinner S. & Jungwirth M. (in print): Die unbekannte dritte Dimension: Geländehöhen, Gewässertiefen und Dynamik österreichischer Donaulandschaften vor der Regulierung (The unknown third dimension: Terrain elevations, water depths and fluvial dynamics of Austrian Danube river landscapes prior to regulation), Österreichische Wasser- und Abfallwirtschaft, Springer (in German with English abstract).
5. Hohensinner S. & Schmid M. (2016): The more dikes the higher the floods: Vienna and its Danube floods. Szabó C. & Tamáska M. (eds): Donau – Stadt – Landschaften II, Publikationen der ungarischen Geschichtsforschung in Wien. LitVerlag Dr. W. Hopf, Berlin, ISBN 978-3-643-90767-7; 211-228.
6. Hohensinner S. (2014): Die Donau und ihre Landschaften - Von der Quelle zur Mündung. INFO Europa 4-2014, 10-12.
7. Hohensinner S. (2015): Historical patterns along the Danube's course. Danube Watch - Journal of the International Commission for the Protection of the Danube River (ICPDR) 2/2015, 6-8.
8. Pollack G. (2013). Verschmutzt – verbaut – vergessen. Eine Umweltgeschichte des Wienflusses von 1780 bis 1910. Social Ecology Working Paper 138, Wien.
9. Spitzbart-Glasl Ch. (2016): Feste Wassermühlen und Schiffsmühlen als Bestandteil der Wiener Gewässerlandschaft. Szabó C. & Tamáska M. (eds): Donau – Stadt – Landschaften II, Publikationen der Ungarischen Geschichtsforschung in Wien. LitVerlag Dr. W. Hopf, Berlin, ISBN 978-3-643-90767-7; 263-278.
10. Winiwarter V. (2016): Challenges for the sustainable development of cities on the Danube. Szabó C. & Tamáska M. (eds): Donau – Stadt – Landschaften II, Publikationen der Ungarischen Geschichtsforschung in Wien. LitVerlag Dr. W. Hopf, Berlin, ISBN 978-3-643-90767-7; 17-28.

Materialien zur Umweltgeschichte
(http://www.umweltgeschichte.aau.at/index,10893,NEU+!!!+ZUG+Materialien+!!!+NEU.html)

11. Gierlinger S. (2015) Die Jahresberichte des Wiener Stadtphysikates 1866-1913. Materialien zur Umweltgeschichte Österreichs 5, Centre for Environmental History, Vienna.
12. Hagen A. (2015): Wiener Bauordnungen und Planungsinstrumente im 19. Jahrhundert. Materialien zur Umweltgeschichte Österreichs 6, Centre for Environmental History Vienna.
13. Hagen A. & Hauer F. (2015): Hygiene und Wasser in der städtebaulichen Fachliteratur um 1900. Materialien zur Umweltgeschichte Österreichs 7, Centre for Environmental History Vienna.
14. Hohensinner S. (2015): Historische Hochwässer der Wiener Donau und ihrer Zubringer. Materialien zur Umweltgeschichte Österreichs 1, Centre for Environmental History, Vienna.

15. Hohensinner S. & Hahmann A. (2015): Historische Wasserbauten an der Wiener Donau und ihren Zubringern. Materialien zur Umweltgeschichte Österreichs 2, Centre for Environmental History, Vienna.
16. Hohensinner S. (2015): Bibliografie historischer Karten und Literatur zu österreichischen Flusslandschaften. Materialien zur Umweltgeschichte Österreichs 3, Centre for Environmental History, Vienna.
17. Spitzbart-Glasl Ch. (2015): Die topographische und hydrotechnische Aufnahme des Wienflusses unter Prof. Josef Stummer 1847 – 1857. Materialien zur Umweltgeschichte Österreichs 4, Centre for Environmental History Vienna.

Master Thesis

18. Gruber Ch. (2015): Historical fish market data and fish ecological changes in the Austrian Danube from 1860 to 1914. Master thesis, University of Natural Resources and Life Sciences Vienna, Austria.
19. Hahmann A. (2015): Cost structure of Historical River Engineering Measures on the Viennese Danube. Master thesis, University of Natural Resources and Life Sciences Vienna, Austria.
20. Leineweber J. (2015): Nur ein unsichtbares Gewässer: der Liesingbach und seine Bedeutung für die räumliche Entwicklung vom ländlichen Umland zur Peripherie der Stadt Wien. Masterarbeit an der Technischen Universität Wien.
21. Slavicek D. (2016): GIS-basierte Rekonstruktion ausgewählter Gewässernutzungen der Wiener Donauzubringer und deren Wasserversorgung und Abwasserentsorgung zwischen 1780-1900. Master thesis, University of Natural Resources and Life Sciences Vienna, Austria.
22. Tanzer, Julia (2016): Historische morphologische Veränderungen der südlichen Wiener Donauzubringer. Master thesis, University of Natural Resources and Life Sciences Vienna, Austria.

Accepted or in review

23. Hauer F. & Hohensinner S. (in review): Wasser, Garten, Stadtfragment. Entstehung und Metamorphosen des Erdberger Maises. Wiener Geschichtsblätter.

1.3 Planned publications

(journals, monographs, anthologies, contributions to anthologies, proceedings, research data, etc.)

1. Haidvogl G., Winiwarter V., Dressel G., Gierlinger S., Hauer F., Hohensinner S., Spitzbart-Glasl Ch., Pollack G. & Raith E. (in prep.): Urban Waters and the long-term development of Vienna. (to be submitted to Environmental History)
2. Hauer F. & Spitzbart-Glasl Ch. (in prep.): Wiener Neustädter Kanal (to be submitted to Wiener Geschichtsblätter)
3. Spitzbart-Glasl Ch., Hohensinner S., Sonnlechner Ch. (in prep.): Making a Living on the Water's Edge: Rivers and Mills in Early Modern Vienna. (to be submitted to Environment & History)

Master-theses

4. Fink, Magdalena (in prep.): Wiener Wasser in aller Munde – Umwelthistorische Diskursanalyse zur II. Hochquellenwasserleitung. Master thesis, Alpen-Adria Universität Klagenfurt, Austria.
5. Reichstein J. (in prep.): Historische morphologische Veränderungen des Wienflusses. Master thesis, University of Natural Resources and Life Sciences Vienna, Austria.

6. Schnee E. (in prep.): Die Stadtentwicklung im Wiental seit 1825. Master thesis, Vienna University of Technology
7. Streitberger A. (in prep.): Historische morphologische Veränderungen der nördlichen Wiener Donauzubringer. Master thesis, University of Natural Resources and Life Sciences Vienna, Austria.

1.4 Presentations

International and national conferences, scientific seminars

1. Gierlinger S. & Brabec S. (2014): Fuelling the City: the changing role of the Danube for meeting Vienna's wood demand. Word Congress of Environmental History (WCEH), July 11, 2014, Guimaraes, Portugal.

2. Gierlinger S. (2014): Pollution vs. Valuable Resource: Sewage in 19th century Vienna. European Social Science History Conference (ESSHC), April 23, 2014, Vienna, Austria.

3. Gierlinger S. (2015): Animal slaughtering and processing of animal parts in the industrializing city of Vienna. Estonian Centre for Environmental History, Graduate School in Environmental History, May 13-15, 2015, Läänemaa, Estonia.

4. Gierlinger S. (2015): Wien und die Schwemmkanalisation. Conference Donau – Stadt – Landschaften II, Österreichisches Kulturforum Budapest in cooperation with Collegium Hungaricum Wien, January 23, 2015, Budapest, Hungary.

5. Gierlinger S., Hauer F., Pollack G., Spitzbart-Glasl Ch. (2015): Umweltgeschichte der Wiener Gewässerlandschaft 1683-1918 – Ein Arbeitsbericht. Research seminar, Institute of Social Ecology, AAU, May 27, 2015, Vienna, Austria.

6. Gierlinger S., Hauer F., Pollack G., Spitzbart-Glasl Ch. (2015): Vienna´s urban water network 1683 to present. An interdisciplinary stroll. 8th Conference of the European Society for Environmental History, Jun 30 - Jul 3, 2015, Versailles, France.

7. Gierlinger S., Hauer F., Pollack G., Spitzbart-Glasl Ch. (2015): Wien und seine Gewässer von 1683 bis heute – ein interdisziplinärer Spaziergang. 70. Minisymposium des Zentrums für Umweltgeschichte, IFF Wien-AAU, November, 11 2015, Vienna, Austria.

8. Haidvogl G., Gruber Ch. & Pont D. (2015): Using historical fish market data (1880-1914) to reconstruct fish composition changes of the Austrian Danube at the turn from the 19th to the 20th century. 2nd I.S. Rivers Conference, June 22-26, 2015, Lyon, France.

9. Hauer F. & Spitzbart-Glasl Ch. (2015): Hybrid Waters and Urban Spaces: A conceptual and methodological approach to energetic water use. Water History Conference, TU Delft, June 25, 2015, Delft, Netherlands.

10. Hauer F. (2014): How water and its use shaped Vienna´s development in space. GRAINES Summer School: The European City in Transformation: From the Early Modern Period to the Present, Institute for East European History, University of Vienna, June 11, 2014, Vienna, Austria.

11. Hauer F. (2014): Wasser und Stadtentwicklung - Stadtmorphologische Annäherungen. Conference „Donau-Stadt-Landschaften", Institut für Ungarische Geschichtsforschung in Wien, April 16, 2014, Vienna, Austria.

12. Hauer F. (2015): Wien und die Donau(auen): Zur Entstehung einer Stadt-Landschaft, Conference Donau – Stadt – Landschaften II, Österreichisches Kulturforum Budapest in cooperation with Collegium Hungaricum Wien, January 23, 2015, Budapest, Hungary.

13. Hohensinner S. (2015): Learning from past Danube dynamics: hydromorphology, river training and flood conveyance. Symposium on Regional Floods - Effects of Changes in the River System, October 13-14, 2015, Vienna, Austria.

14. Hohensinner S. (2015): Mehr Dämme – höhere Fluten: Wien und die Donauhochwässer. Conference Donau – Stadt – Landschaften II, Österreichisches Kulturforum Budapest in cooperation with Collegium Hungaricum Wien, January 23, 2015, Budapest, Hungary.

15. Hohensinner S., Drescher A., Eckmüllner O., Egger G., Gierlinger S., Hager H. & Haidvogl G. (2015): Wood resources in dynamic Danube floodplains - historical reconstruction and implications for management and restoration. 2nd I.S. Rivers Conference, June 22-26, 2015, Lyon, France.

16. Hohensinner S., Drescher A., Eckmüllner O., Egger G., Gierlinger S., Hager H. & Haidvogl G. (2015): Modelling Vienna's historical wood resources and wood demand. "Greening History", 8th Conference of the European Society for Environmental History, Jun 30 - Jul 3, 2015, Versailles, France.

17. Jungwirth M. & Hohensinner S. (2015): Gewässerökologische Betrachtungen zur Entwicklung der Flusslandschaft. Flussbausymposium Donau - Wasserbau östlich Wien: Wie geht es weiter? Im Spannungsfeld der Interessen von Naturschutz, Schifffahrt und Hochwasserschutz, June 19, 2015, Vienna, Austria.

18. Pollack G. & Gierlinger S. (2015): Using and abusing a torrential urban river. The Wien River before and during industrialization. Water History Conference, TU Delft, June 25, 2015, Delft, Netherlands.

19. Pollack G. (2014): From multifunctionality to segregation: The history of the Wien River in the 18th and 19th century. GRAINES Summer School: The European City in Transformation: From the Early Modern Period to the Present, Institute for East European History, University of Vienna, June 11, 2014, Vienna, Austria.

20. Pollack G. (2014): Verschmutzt - verbaut - vergessen: Eine Umweltgeschichte des Wienflusses von 1780 bis 1910. Conference Donau-Stadt-Landschaften, Institut für Ungarische Geschichtsforschung in Wien, April 16, 2014, Vienna, Austria.

21. Spitzbart-Glasl Ch. & Sonnlechner Ch. (2016): Urbanizing Vienna's Waters II: Long-term socio-natural transformation of urban rivers through watermills. Urban History Conference 2016, August 2016, Helsinki, Finland (accepted)

22. Spitzbart-Glasl Ch. (2014): The Wien River in the mid-19th century – a description by text and image. Case Study for KOSMOS Summer University. Humboldt-Universität zu Berlin, September 2014, Berlin, Germany.

23. Spitzbart-Glasl Ch. (2015): Mühlen als Bestandteil urbaner Gewässerlandschaften. Eine Umweltgeschichte am Beispiel Wiens, 17. bis 20. Jahrhundert. Oberseminar Neuere und Neueste Geschichte, Technische Universität Darmstadt, July 14, 2015, Darmstadt, Germany.

24. Spitzbart-Glasl Ch. (2015): Mühlen in Wien und Budapest – Verbindungen zwischen städtischen Mühlenlandschaften im 19. Jahrhundert. Conference Donau – Stadt –

Landschaften II, Österreichisches Kulturforum Budapest in cooperation with Collegium Hungaricum Wien, January 23, 2015, Budapest, Hungary.

25. Tanzer J. (2015): Historical morphological changes of the Danube tributaries in southern Vienna. ELLS Scientific Student Conference: Challenges of global resource management – social, environmental and economic dimensions. November 13-14, 2015, Prague, Czech Republic.

26. Winiwarter V. & Spitzbart-Glasl Ch. (2016): The difficult task of going with the flow: The importance of riverine energy for early modern society. Mobilising and Using Energy, from Antiquity to the Present Time, Bordeaux-Montaigne University, France, September 8-10, 2016, Bordeaux, France (accepted).

27. Winiwarter V. (2015): Die Herausforderungen für nachhaltige Entwicklung der Städte an der Donau. Conference „Donau – Stadt – Landschaften II“, Österreichisches Kulturforum Budapest in cooperation with Collegium Hungaricum Wien, January 23, 2015, Budapest, Hungary.

28. Winiwarter V., Haidvogl G., Pollack G. & Slavicek D. (2016): Using and abusing a torrential urban river. Tanneries and other crafts at a Viennese Danube tributary before and during industrialisation (Wien River, Vienna-Austria). American Society of Environmental History, Annual Conference 2016, April 1, 2016, Seattle, USA.

Teaching

Hauer F. (2015): Seminar „Sondergebiete der territorialen Transformation, Fachbereich Städtebau, Vienna University of Technology, March 19, 2015. Guest lectures:

Gierlinger S. (2015): Wasser Ver- und Entsorgung im 19. Jahrhundert. Das Entstehen großer Netzwerksysteme.

Pollack G. (2015): Transformationen am Wienfluss. Warum der Wienfluss heute so ausschaut wie er ausschaut.

Spitzbart-Glasl Ch. (2015): Dynamik und Permanenz von Wiener Mühlen-landschaften.

Gierlinger S., Hauer F., Pollack G., Spitzbart-Glasl Ch. (2015): Vienna‘s urban water network 1683 to present – an interdisciplinary stroll. Lecture „Grundlagen inter- und transdisziplinärer Wissenschaft“, IFF Wien, Alpen-Adria Universität, May 28, 2015.

Hauer F. (2014): Stadtlandschaft und Gewässerlandschaft Wiens. Lecture „Stadtmorphologie“, Vienna University of Technology, May 22, 2015.

Hauer F. (2016): Städtebau: Wien im Fluss. Seminar, Bachelorstudium Architektur, Vienna University of Technology.

Hohensinner S. (2014): Hydromorphological changes of the Danube River. DIANET International School "The Role of Natural Heritage for the Sustainable Development of the Danube Region", March 24, 2014, Gorizia, Italy.

Pollack G. & Schmid M. (2015): Umweltgeschichte der Wiener Gewässer. Seminar and excursion, Institut für Soziale Ökologie, IFF, Alpen-Adria Universität.

Spitzbart-Glasl Ch. & Schmid M. (2016): Umwelthistorisches Arbeiten (am Beispiel der Umweltgeschichte der Wiener Gewässer). Seminar, Institut für Soziale Ökologie, IFF, Alpen-Adria Universität.

2. Most important academic awards

(Specific academic awards, honours, prizes, medals or other merits)

No academic awards were granted.

3. Information on results relevant to commercial applications

No results relevant to commercial applications were made.

4. Publications for the general public and other publications

(Absolute figures, separate reporting of national / international publications)

- Type of dissemination activities:
    1. Self-authored publications on the World Wide Web
    2. Editorial contributions in the media (print, radio, TV, www, etc.)
    3. (Participatory) contributions within science communication
    4. Popular science contributions (books, lectures, exhibitions, films, etc.)

	national	**International**
Self-authored publications on the www	1	
Editorial contributions in the media	5	
(Participatory) contributions within science communication	1	
Popular science contributions	1	

List of contributions

1. ORF2 / Heute Leben, 31.1.2014

2. Bachkanal - ein Bericht in ORF2 / Heute Leben, 16.5.2014

3. Verschwundene Bäche unter Wiens Straßen, Wiener Zeitung, 1.9.2014, Link zum Artikel .

4. Die Wiener Gewässer. Eine Zeitreise für SchülerInnen und alle Interessierten, September 2015.

5. Wie die Wienerwaldbäche verschwanden - ein Bericht von Martin Kugler, Universum Magazin 9, September 2015, S. 68 – 75.

6. Wie sich Wiens Gewässer mit der Zeit wandelten, Die Presse, Wissen & Innovation, 19. 9. 2015, S. 35.

7. Winiwarter, Verena, Sonnlechner, Christoph, Gierlinger, Sylvia, Haidvogl, Gertrud, Hauer, Friedrich, Hohensinner, Severin, Pollack, Gudrun & Spitzbart-Glasl, Christina (2015). Wien und seine Gewässer. Eine turbulente Umweltgeschichte. Veröffentlichungen des Wiener Stadt- und Landesarchivs, Reihe B: Ausstellungskataloge, Heft 93, Wien, 2015.

8. Hohensinner, Severin, Lager, Bernhard, Reichstein, Julian, Streitberger, Alexander, Tanzer, Julia, Schuller, Verena, Hahmann, Alexander. & Winiwarter, Verena (2015): Historische Landschaftsentwicklung in Wien seit dem Jahr 1529 (Evolution of Vienna's land and waterscape since 1529 CE). Wien Kulturgut - Digital City Maps of Vienna. (interactive Web-GIS platform: https://www.wien.gv.at/kultur/kulturgut/geschichte/landschaftsentwicklung.html)

Exhibition

Wien und seine Gewässer. Eine turbulente Umweltgeschichte. Kleinausstellung des Wiener Stadt- und Landesarchivs in Zusammenarbeit mit dem Verein für Geschichte der Stadt Wien, 7.9.2015 - 26.02.2016.

5. Development of collaborations

Indication of the most important collaborations (no more than 5) that took place (i.e. were initiated or continued) in the course of the project. Please provide the name of the collaboration partner (name, title, institution) and a few words about the scientific content. Please **categorise** each collaboration arrangement as follows:

N				Nationality of collaboration partner (please use the ISO-3-letter country code)	
	G			Gender	**F (**female) **M** (male)
		E		Extent **E1** **E2** **E3**	**low** (e.g. no joint publications, but mention in acknowledgements or similar); **medium** (collaboration e.g. with occasional joint publications, exchange of materials or similar, but no longer-term exchange of personnel); **high** (extensive collaboration with mutual hosting of group members for research stays, regular joint publications, etc.)
			D	Discipline	**W** **within the discipline** (within the same scientific field) **I** **interdisciplinary** (involving two or more disciplines) **T** **transdisciplinary** (collaborations outside the sciences)

N	G	E	D	Name	Institution
FRA	F	E2	W	Sabine Barles	Université Paris 1 - Sorbonne Paris, Institute of Geography
DEU	M	E2	W	Christoph Bernhard	IRS-Leibniz-Institute for Regional Development and Structural Planning
CAN	M	E2	W	Stéphane Castonguay	Université du Québec à Trois-Rivières, Social Sciences and Humanities
BEL	F	E1	W	Cloé Deligne	University Brussels, Département d'Histoire, Arts et Archéologie
CAN	M	E3	W	Richard Hoffmann	York University, Department of History
DEU/AUT	M	E3	W	Martin Knoll	Universität Salzburg, Fachbereich Geschichte, Europäische Regionalgeschichte

N	G	E	D	Name	Institution
CHE	M	E1	I	Sylvain Malfroy	College of Engineering and Architecture, Fribourg
ITA/FRA	M	E2	W	Giacomo Parrinello	Paris Institute of Political Studies, Centre for History
FRA	M	E3	I	Didier Pont	IRSTEA, Centre d'Antony, HBAN
CAN	M	E1	W	Pierre-Claude Reynard	Western University Canada, Department of History

Note: General scientific contact and occasional meetings should not be considered collaborations for the purposes of this report.

6. Development of human resources in the course of the project

(Absolute figures with an indication of status (in progress / completed)

Note: It is not possible to assign a *venia* thesis / work (*Habilitation*) to a single project; here it is necessary to mention those *venia* theses for which the project was important. A similar caveat applies to Ph.D. and diploma theses: The FWF does not support thesis work, but instead funds the scientific work that forms the basis for such theses.

	In progress	Completed	Gender	
			f	m
Full professorship		2	1	1
Venia thesis (*Habilitation*) / Equivalent senior scientist qualification	2		1	1
Postdoc				
Ph.D. theses	4			
Master's theses	3	5	5	3
Diploma theses				
Bachelor's theses				

7. Applications for follow-up projects

(Please indicate the status of each project and the funding organisation)

7.1 Applications for follow-up projects (FWF projects)
Please indicate the project type (e.g. stand-alone project, SFB, DK, etc.)

No application for a follow-up project in a strict sense was made. However, project findings were the basis for a stand-alone project “Learning for flood protection from torrential urban rivers”, submitted to FWF in July 2016.

7.2 Applications for follow-up projects (Other national projects)
(e.g. FFG, CD Laboratory, K-plus centres, funding from the Austrian central bank [OeNB], Austrian federal government, provincial agencies, provincial government or similar sources)

No application for national follow-up projects were made.

7.3 Applications for follow-up projects (international projects) (e.g. EU, ERC or other international funding agencies)

No application for international follow-up projects were made.