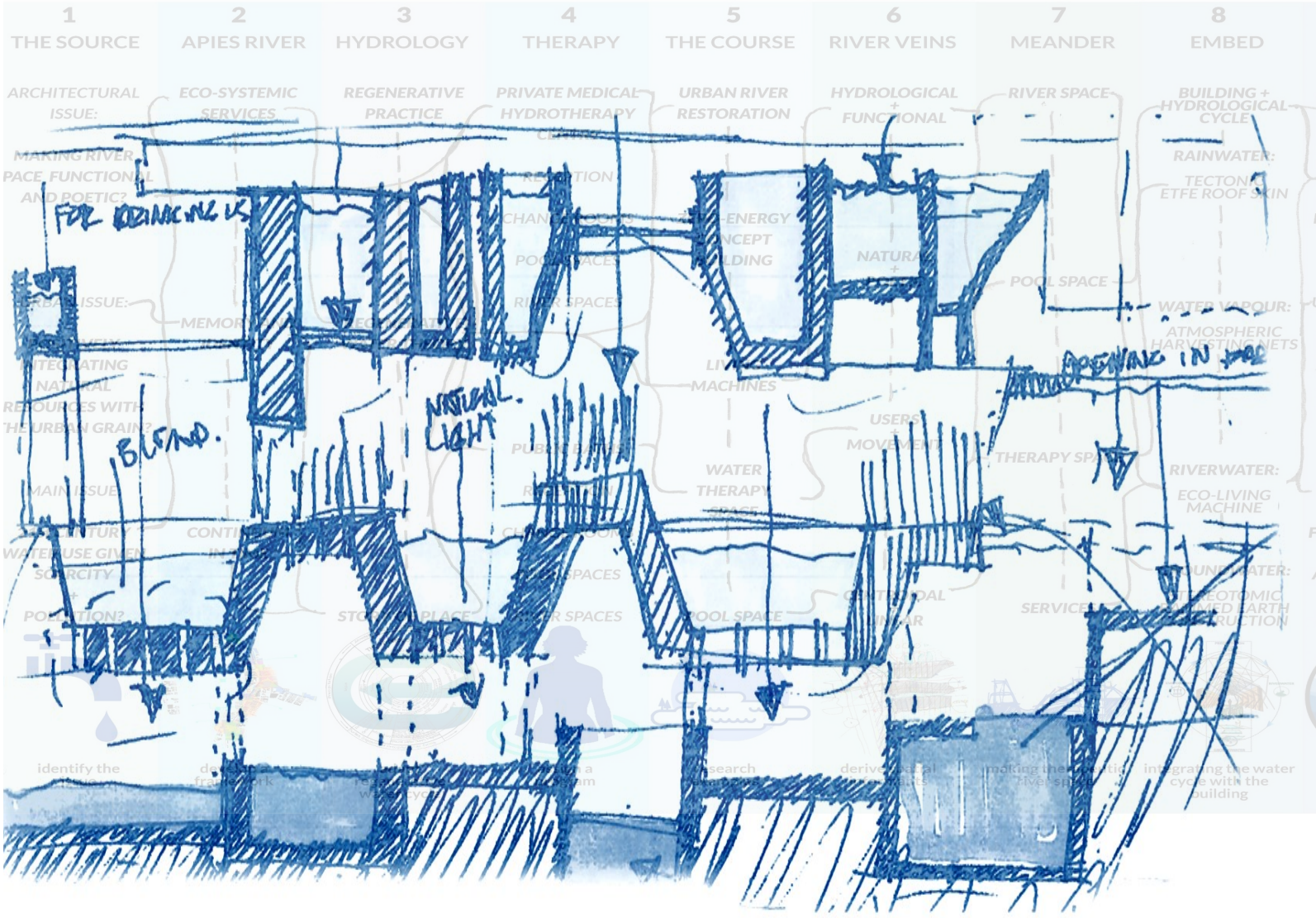


CHAPTER 9
CONCLUSION

REFLECT

Figure 9.1. Sketch showing qualities of water, structure, nature and light in formulating appropriate river space. Author, 2016.

9.1 REVIEW: ISSUES AND INTENTIONS

9.1.1 GENERAL ISSUE

How do designers facilitate 21st century water needs and how do we remain cognitive about its importance or relevance in a world where natural resources are becoming increasingly polluted and scarce?

South Africa is considered an arid country with threatened eco-systemic river networks as illustrated by Action Aid South Africa (see Chapter 1,). Centralised urban water planning will continue in social practice according to Sedlack (2014: 244). If urban water networks are strategically updated with innovative bio-technologies, our current water systems and infrastructure would better serve urban and rural settlements. Each city should guide its own criteria regarding a sustainable pathway for its local water distribution and usage, Sedlack (2014: 244).

In the urban realm, water can be conserved and appreciated by providing public urban river space that exposes issues confronting water pollution or scarcity and showcase technological solutions regarding water as a valuable resource in the 21st century (see Figure 9.2 and 9.5). Water should not only be seen as a resource requiring consistent conservation. Water should be celebrated and functionally exposed as per the dissertation's balanced architectural solution of water purifying technologies with therapeutic pool spaces.

9.1.2 URBAN ISSUE

How do we positively integrate river space in an urban environment?

Historically, flood control, water supply, water quality and urban riverfronts were treated as isolated design responses in order to facilitate transitional urban growth, as stated by Robert France and James Macbroom (2002: 379). In the 21st century, an appropriate response would be to synthesise these layered programmatic responses into an integrated whole that facilitates human and ecological needs (France and Macbroom, 2002:379). Urban river spaces require design potential that allows for public access, historical and cultural narratives, and recreational opportunities (France and Macbroom, 2002:379).

The dissertation applied a regenerative water method (see Chapter 3) that contributes a therapeutic, water purifying function, spatially allocated as a connecting urban riverfront to the surrounding isolated programs (see Figures 8.15 and 8.16).

It is considered as an additive and synthesised response based on the Apies River's previous natural and historical layers. The design response is intended to maintain and to operate the qualities of the site according to regenerative design principles (see Chapter 3) Prinshof Medical District and along the Apies River.

Figure. 9.2. Connect communities to waterways. www.epa.gov. 2016.

9.1 REVIEW

9.1.3 ARCHITECTURAL ISSUE

How does architecture engage with basic water infrastructure towards a regenerative intervention that is both poetic and functional?

An architectural response regarding the engagement with the Apies River channel arises out of mapped hydrological elements as found on site (see Chapter 2 mapping exercises). The mapped exercises may extend, as per this dissertation's instance to the natural, human and experiential layers as identified on site. The Apies River was seen as the primary spatial element requiring a substantial amount of focus (see Chapter 6).

The riverfront space forms part of a spatial response that would relate the open site to the river and mediate linkages to the surrounding buildings which were identified as operating in isolation. The building program (see Chapter 4) required the combination of an appropriate functional response to the Prinshof Medical District, as well as to mediate a potential regenerative impact that could be drawn from the water of the Apies River. Water mediates the role of therapeutic, medical and leisurely water healing spaces. This informed the architectural intervention as it was embedded in the hydrological cycle of the site. The architectural intervention combines an integrated water strategy involving collection, purification, storage and distribution which draws on the site's potential for river water, rainwater, groundwater and atmospheric harvesting (see Figure 8.31).

These strategies informs the architectural approach of employing and showcasing functional water technologies with the poetics of experiencing architectural space that manipulates building surfaces to embed the building within the hydrological cycle. This was architecturally expressed in the 'tectonic' lightness of an ETFE roof system that conveys rainwater via drainage channels towards water storage tanks. Rammed earth construction expresses 'stereotomic' heaviness of the harvested groundwater.

Eco-Living Machine technologies would systematically and spatially form part of the architectural intervention. Atmospheric harvesting nets passively collect water from the atmosphere and was inserted in allocated green spaces. The architectural response embeds the building in the hydrological cycle and appropriates the building's exterior pool spaces which open up to the Apies River (see Figure 9.3 and 9.4). This approach synthesises water's infrastructural requirements required for a building to function and in principal, to enhance the spatial experience of the hydrological cycle by the user.

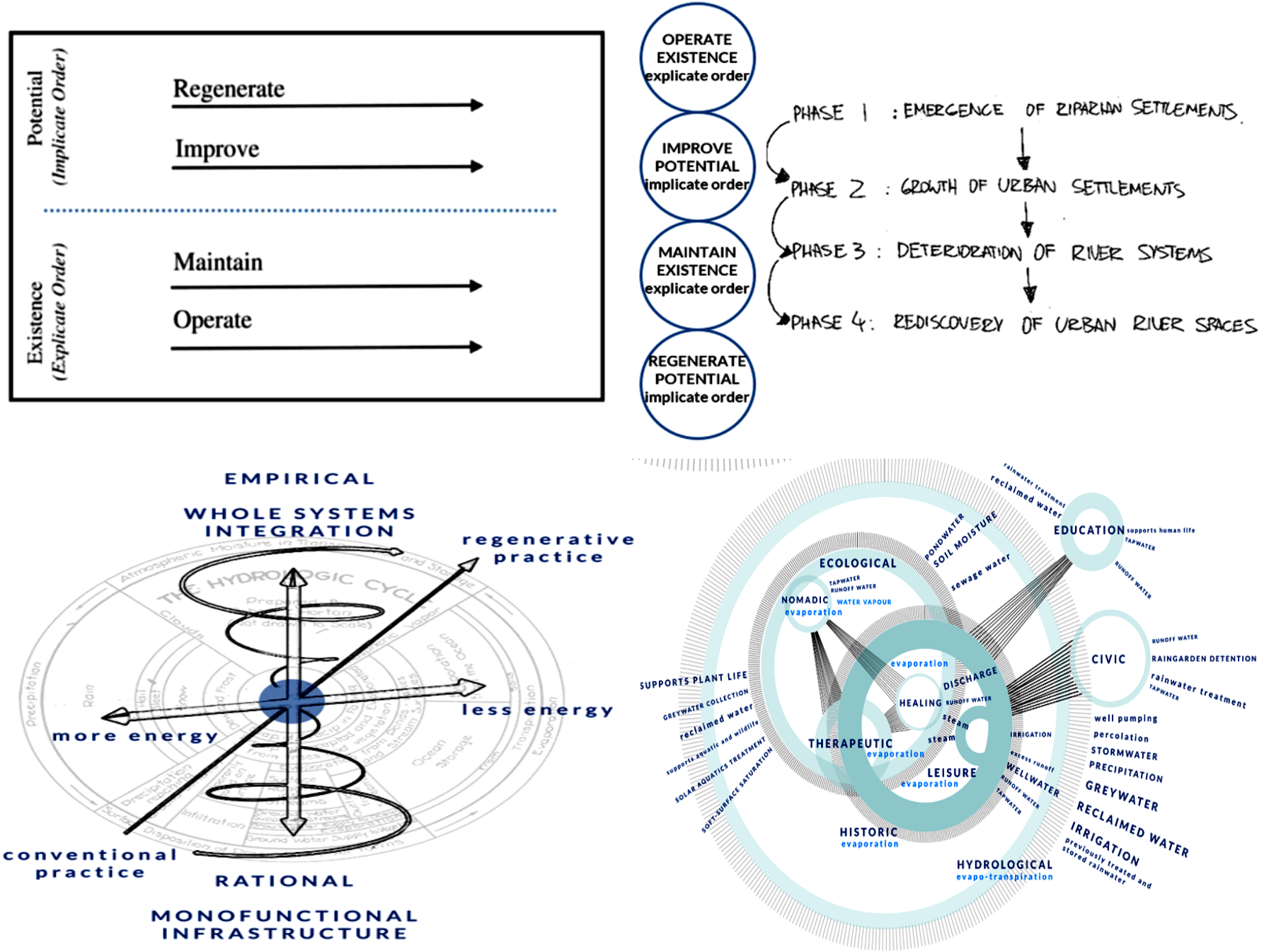


Figure. 9.3. Regenerative approach to project dissertation and spatial outcome (adapted sketch from Mang and Reed). Author, 2016.

9.2 THE WAY FORWARD

9.2.1 URBAN ISSUE

How do we positively integrate river space in an urban environment?

9.2.2 URBAN ISSUE: THE WAY FORWARD

Returning rivers to a natural state is not feasible in most scenarios according to Robert Speed et al. (2016:54). Many early river restoration initiatives promoted the concept of reforming rivers to a natural state. Many projects were successful and many riverfronts were not realised. Accordingly, many river restoration approaches and guidelines have planned restoration objectives based on historical or similar precedents as argued by Speed et al. (2016:57).

The acceleration of physical change in global urban river conditions frequently makes river naturalisation impractical due to physical and economical limitations (Speed et al., 2016: 54).

In China, the concept of returning a river to pre-development conditions is irrelevant for the local populace given the historical background of man-made alterations made to the river (Speed et al, 2016: 54). As a result, water resource organisations need to revise their approach in achieving river restoration objectives (see Figure 9.3). The scale and complexity of river management and restoration issues is challenging the capacity of scientific concepts of rivers to identify when and what action is necessary to best address declining river health according to Speed et al. (2016:57). Strategic river restoration requires a robust approach that factors societal demands which are gradually evolving.

In order to ensure the advantages of river restoration are perpetually in operation, it requires financial sustainability to seamlessly integrate with ecological responsibility Speed et al. (2016:54) . They are seldom maintenance free and require ongoing management budgets as stated by Speed et al. (2016:54). Sustainability requires a river ecosystem to acquire an adaptive capacity to maintain its restored condition, by being self-sustaining Speed et al. (2016:56).

River restoration needs to tolerate different functions that a river performs and determine which needs to be prioritised. It requires the acknowledgement that a river will perform different functions or hydro-social contracts at different geographic locations at the core or perimeter of river catchment basins Speed et al. (2016:57).

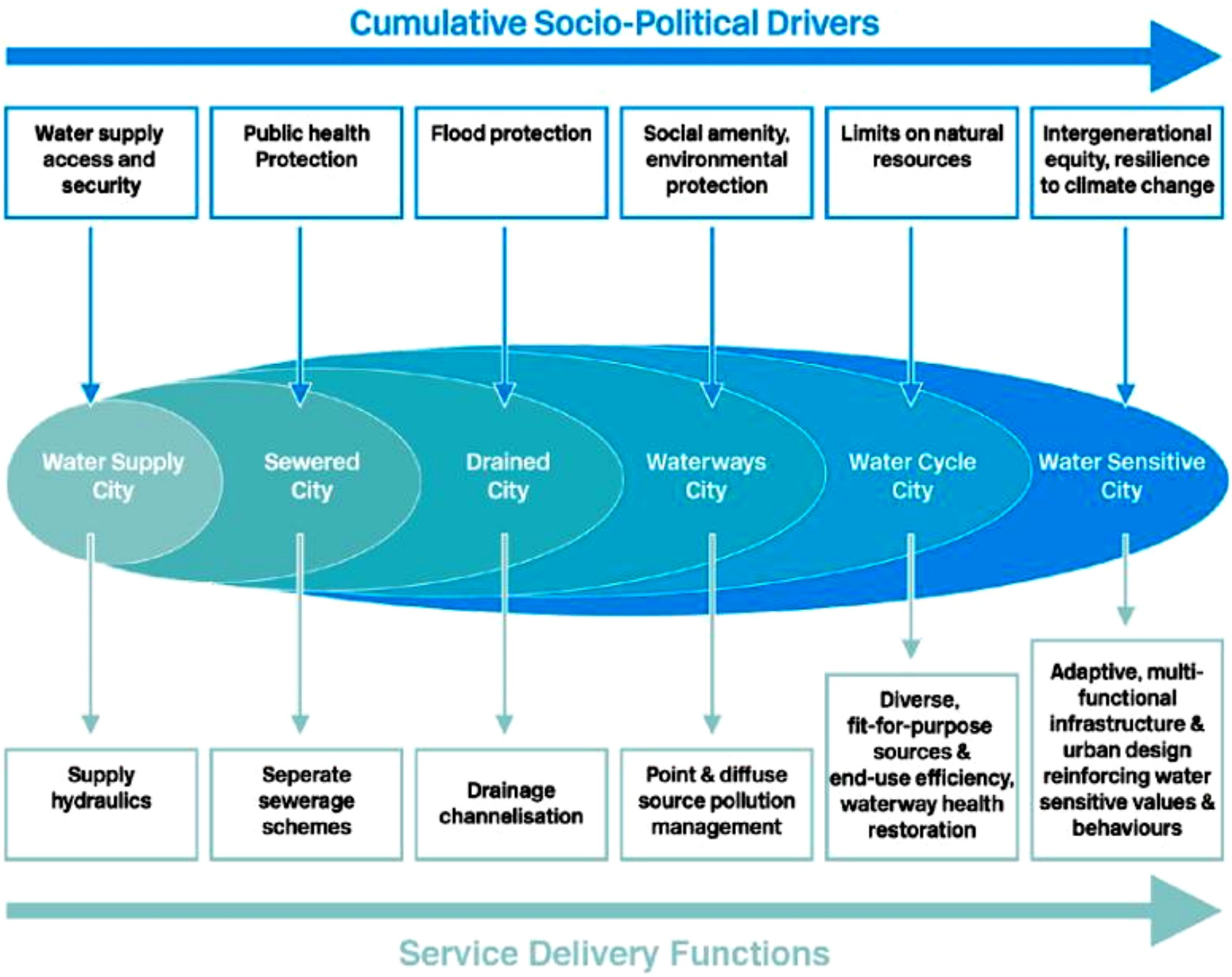


Figure 9.4. Typology framework of different city-states in transition towards sustainable water development.p.152, Speed et al., 2016.

Figure. 9.5. Bio-historic approach to project dissertation: final iteration in comparison to conceptual iteration. Author, 2016.

9.3 SOLUTION: SYNTHESIS

9.3.1 WATER IN THE FUTURE

Water has supported the landscapes of our civilisations as explained by Anthony Wylson (1986: 3). Earth's evolution and transformation is due to water (Wylson, 1986: 20). Nowadays we are facing complex urban development processes leading to completely new challenges concerning the management and design of urban infrastructure systems and landscapes according to Wylson, (1986:20). The eco-systemic narrative for the 21st century has resulted from historically additive layers of how human settlements have approached natural resources for benefits regarding economic or social development (see Figure 9.4). Water should be 'seen beyond its tap' potential in a manner that is exposed and sought after to improve spatial quality by creating attractive spaces (see Figure 9.5).

9.3.2 APIES RIVER AS AN URBAN REGENERATIVE FORCE

In terms of urban river restoration, Pretoria is a water-sensitive city, that has added biological, drainage, flooding, water supply, water quality and water purification infrastructure typologies in successive layers over time (see Chapter 2, Figure 2.31 and Figure 9.4). Each design response is appropriated to its corresponding natural or man-made issue. Important elements of urban river corridor planning include their relationship with adjacent urban spaces, active programmatic requirements, environmental education (Saw Mill River Precedent, see Figure 5.3), habitat linkages and recreational potential.

9.3.3 WATERSCAPES IN ARCHITECTURE

Waterscapes are constructed water features in public urban spaces that allow people to experience the qualities of water through touch, sight and sound (see Figure 9.6). The rationale behind this way of treatment of water resources is to produce sustainable and beautiful urban spaces where people can engage with the pleasures of water.

Water should be seen not only for its functional aspects in sustaining a building' water needs. Opportunities exist for a poetic approach to be expressed, as per the location of water infrastructures and surfaces that receive water in different locations of the building, i.e. ground, roof, programmed interior spaces and water storage (see Figure 8.20). These are identified as architectural opportunities that have the potential to be dynamically or integrated into the therapeutic experience of 'water spaces'. As pieces of urban infrastructure, waterscapes respect and celebrate the hydrological cycle of nature while simultaneously expressing the valued importance of water for humankind (see Figure 9.7).

Figure. 9.6. Waterscapes conclusion to project dissertation and spatial outcome. Author, 2016.

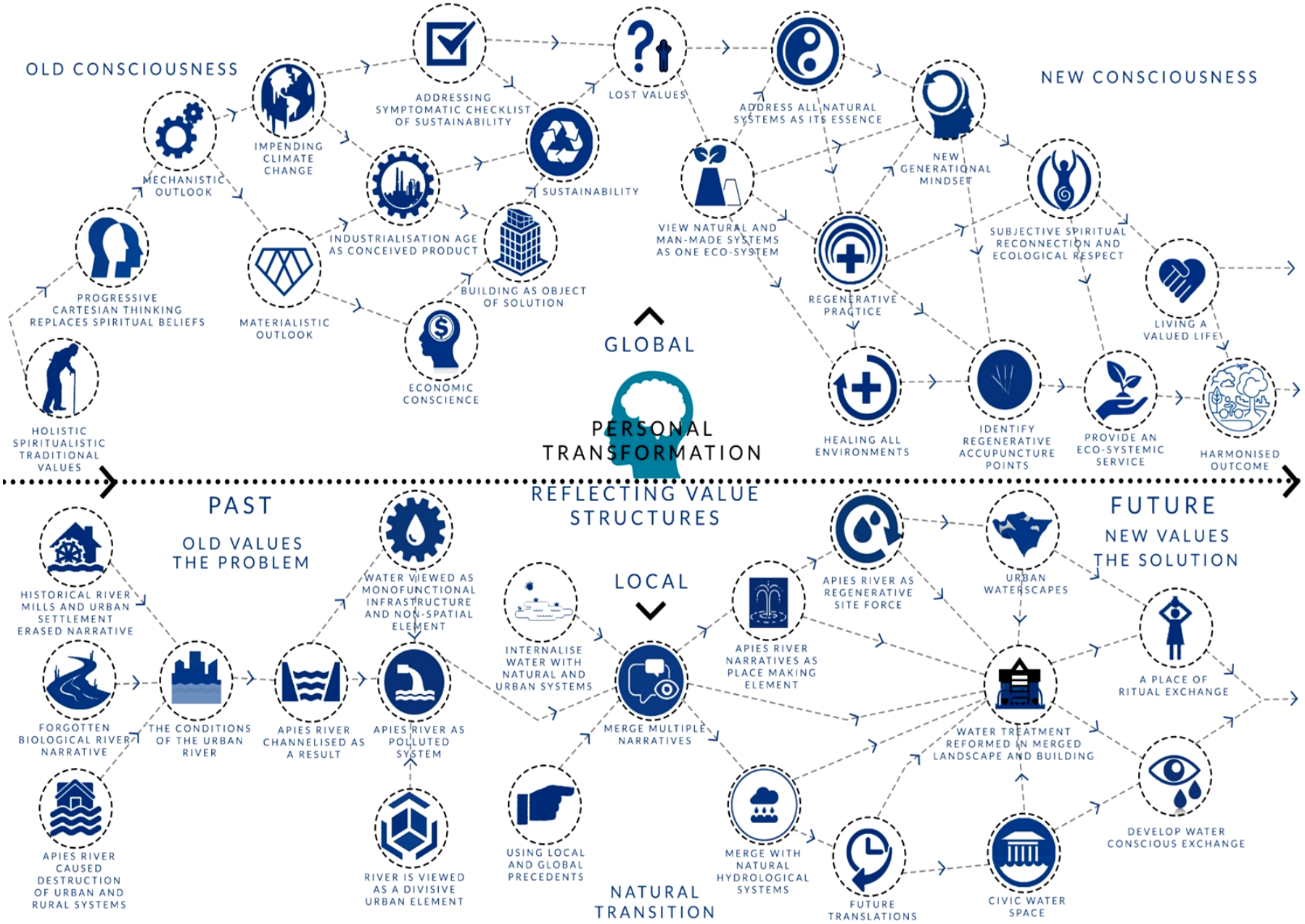


Figure 9.7. Abstract Diagram demonstrating the Apies River Narrative over time. Author, 2016.

9.4 FINAL PRESENTATION

THE SOURCE

REGENERATIVE BIOHISTORIC WATERSCAPES

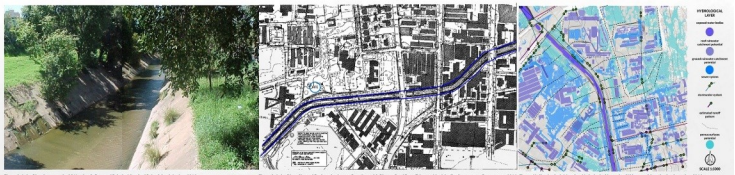
"We live in a world defined by 19th century water law, 20th century infrastructure, and 21st century water needs." - Jennifer Pitt, (medium.com, 2015).

APIES RIVER

NATURAL AND ARTIFICIAL INTERFACES

UNCURATED RIVER SPACE

DISCONNECT



MAIN ISSUE

How do designers facilitate 21st century water needs and how do we remain cognitive about its importance or relevance in a world where natural resources are becoming increasingly polluted and scarce?

ECO-SYSTEMIC SERVICES

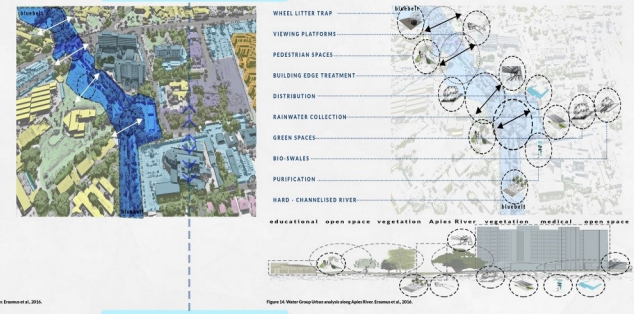
MAPPING SITE POTENTIALS

INTEGRATION WITH THE URBAN GRAIN

PASSIVE AND ACTIVE

WATER INFRASTRUCTURE TYPOLOGIES

ANALYSE RIVER SPATIAL CONDITIONS



URBAN ISSUE

How do we positively integrate a segregated and forgotten bio-historical resource in an urban environment?

MEMORY + IDENTITY

THE RIVER'S IDENTITY

PAST PRESENT FUTURE LAYERS

BLUEBELT

ECOLOGICAL

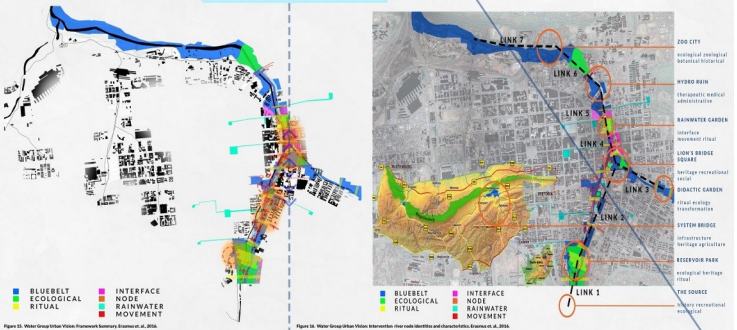
RITUAL

INTERFACES

NODE

RAINWATER

MOVEMENT



ARCHITECTURAL ISSUE

A key concern arises – how should designers manage and develop future urban water projects with environmental consciousness in mind in order to realise a sustainable future scenario?

How do we make river space functional and poetic?

identify the issue

CONTINUUM IN TIME

HISTORICAL CONNECTIONS

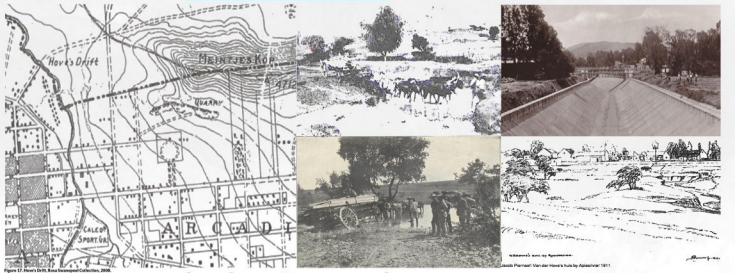
NATURAL SETTING

AGRICULTURAL SETTING

PROCESS OF REBUILDING

MEDICAL DISTRICT

CHANNELISATION



develop a framework

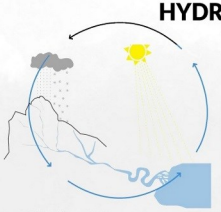
9.4 FINAL PRESENTATION

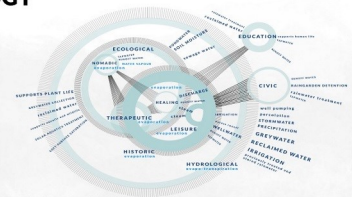
HYDROLOGY

MAN MADE + NATURAL SYSTEMS

THE MAKING OF PLACE

SYNTHESISE HYDROLOGY WITH USER NEEDS

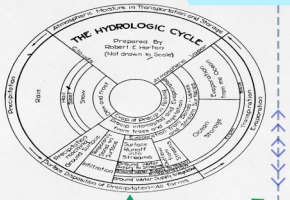


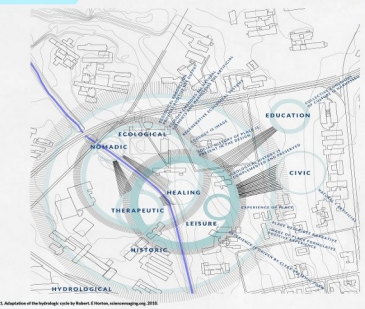


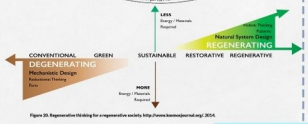
REGENERATIVE PRACTICE

APPLY A SYSTEM OF TECHNOLOGIES AND STRATEGIES BASED ON WORKING OF LIVING SYSTEMS

EXTEND TO LANDSCAPE ELEMENTS STRUCTURAL AND DESIGN ATTRIBUTES



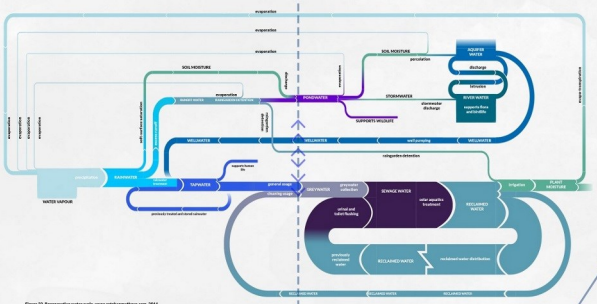




REGENERATIVE WATER THEORY

GENERATE HEALTHIER PATTERNS ON SITE

TECHNOLOGICAL ADAPTATION



STORY OF PLACE

SYNTHESISE NATURAL AND HUMAN SYSTEMS

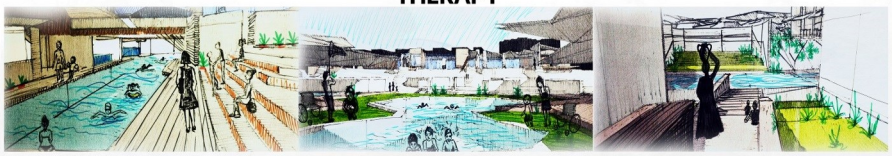
MAKING THERAPEUTIC WATER SPACE

CONTINUE SITE IDENTITY THROUGH HYDROLOGY ECO-SYSTEMIC NARRATIVE

NET POSITIVE SUPPLY AND EFFICIENT RE-USE OF WATER FOR SURROUNDING DISTRICT

adapt regenerative water cycle

THERAPY



MEDICAL HYDROTHERAPY

ARCHITECTURAL RESPONSE

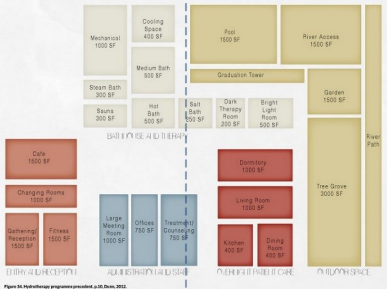
HYDROTHERAPY PROGRAM

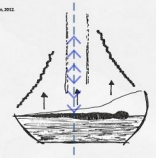
RESPONSE TO SITE DISCONNECTEDNESS

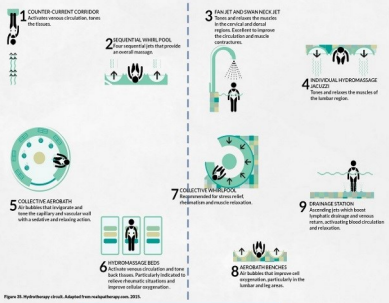
SURROUNDING INSTITUTIONS

INTERPRET WATER IN A SPATIAL FRAMEWORK

CONNECTION POINT







INTERIOR VS. EXTERIOR

SYNTHESIS

FUNCTIONAL WATER THERAPY SPACE

RIVER SPACE

OUTDOOR THERAPY SPACE

LIVING WATER ELEMENT

SCALE

PUBLIC BATHS

URBAN REGENERATIVE RESPONSE

REGENERATE CITY THROUGH WATER PROGRAM

MANIPULATE NATURAL FEATURES ON SITE

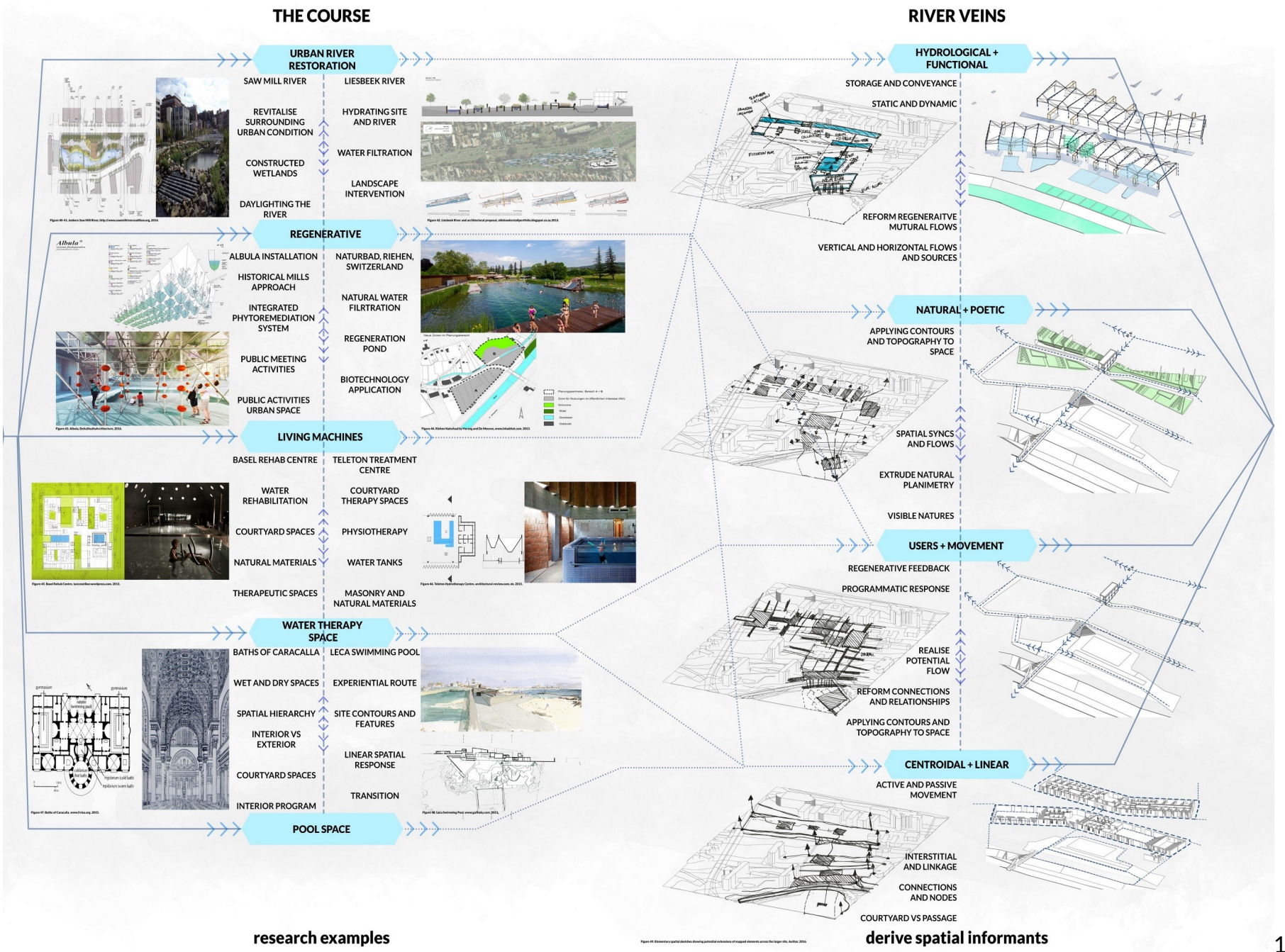
ENHANCE EXPERIENTIAL APPROACH

EXCHANGE BETWEEN NATURAL AND HUMAN SYSTEMS

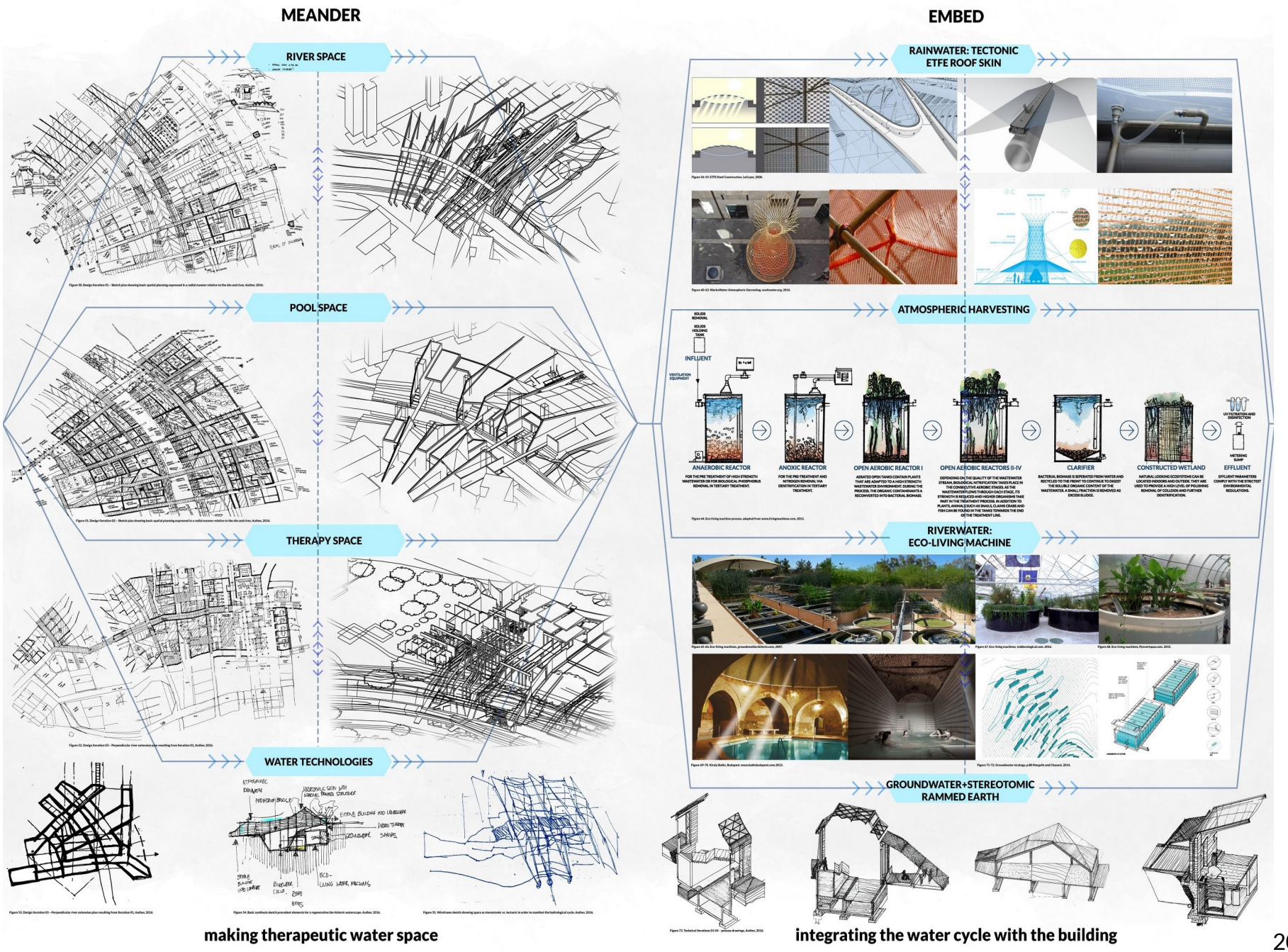
REJUVENATING EXPERIENCE

assign a program

9.4 FINAL PRESENTATION



9.4 FINAL PRESENTATION



9.4 FINAL PRESENTATION

REFLECT

MAIN RESPONSE

How do designers facilitate 21st century water needs and how do we remain cognitive about its importance or relevance in a world where natural resources are becoming increasingly polluted and scarce?

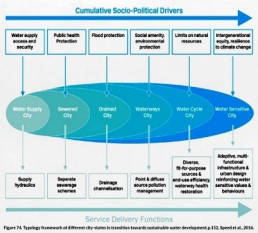


Figure 74. Typology framework of different city-states in transition towards sustainable water development, p.152, Speed et al., 2016.

Layers of the past, present and future needs and requirements of water need to be approached in a manner that synthesises hydrosocial contracts would enable designers to facilitate 21st century needs and make it relevant in today's context where water is becoming increasingly polluted and scarce.

Figure 75. Connect communities to waterways. www.epa.gov. 2016.

URBAN RESPONSE

How do we positively integrate a segregated and forgotten bio-historical resource in an urban environment?

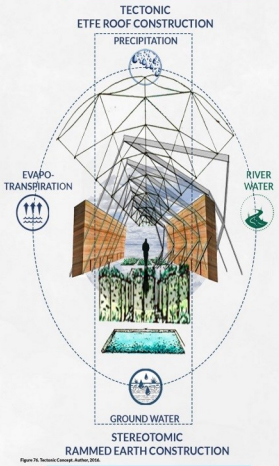
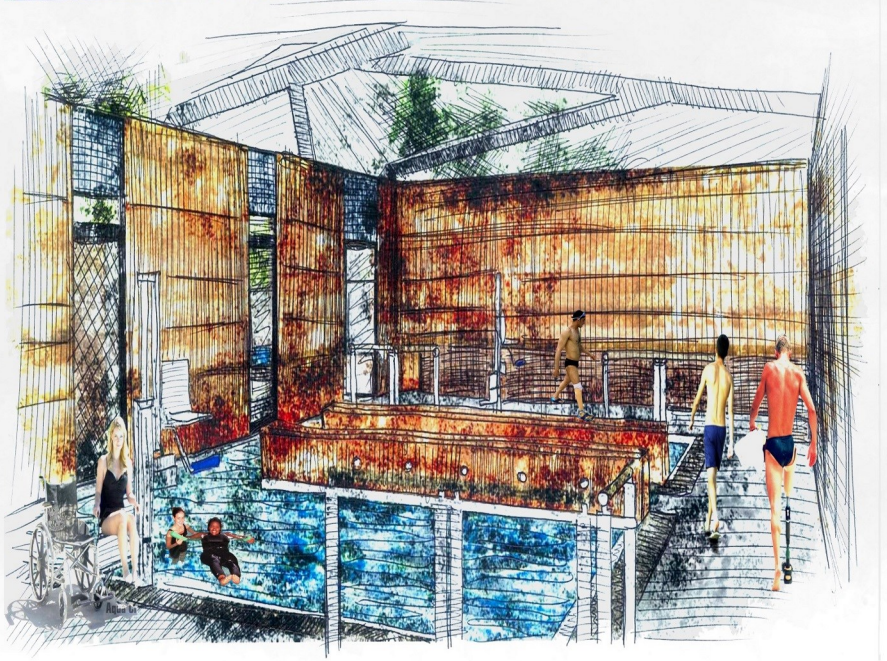


Figure 76. Tectonic Concept. Author, 2016.

By using a regenerative water approach in conjunction with site derived spatial informants as a method to connect the river with the surrounding urban grain.

Systemic eco-systemic limitations exist in addressing the totality of the Apies River.



A key concern arises – how should designers manage and develop future urban water projects with environmental consciousness in mind in order to realise a sustainable future scenario?

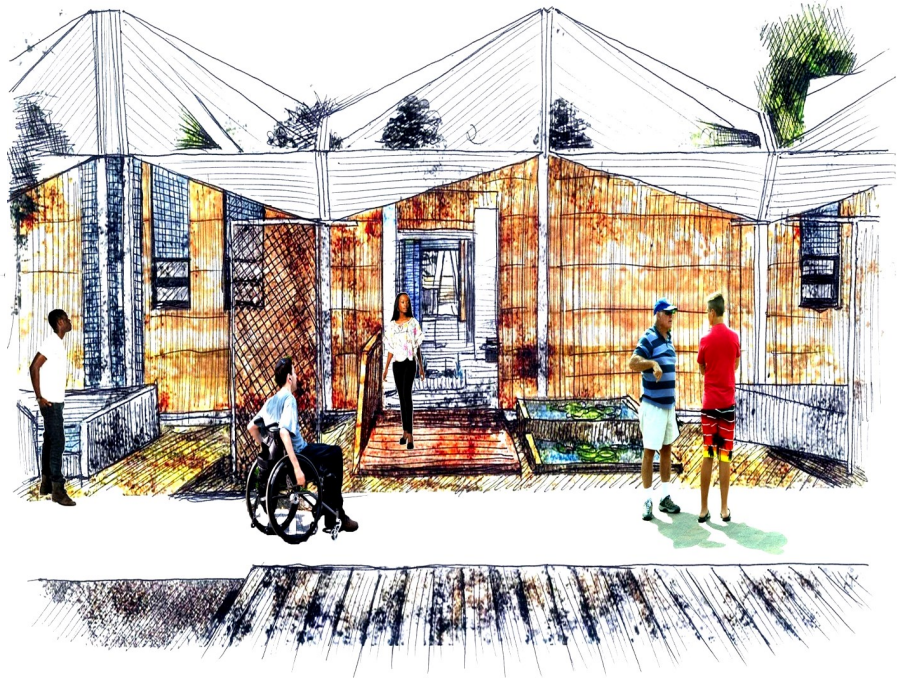
How do we make river space functional and poetic?

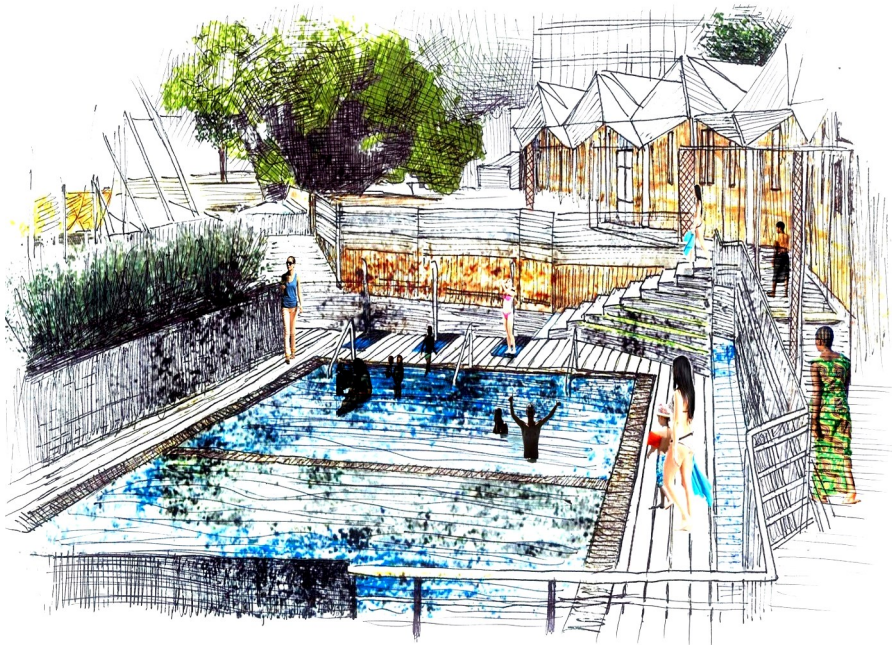
Embed an adjacent architectural intervention in the hydrological cycle as a design strategy for making river space functional and experiential.

ARCHITECTURAL RESPONSE

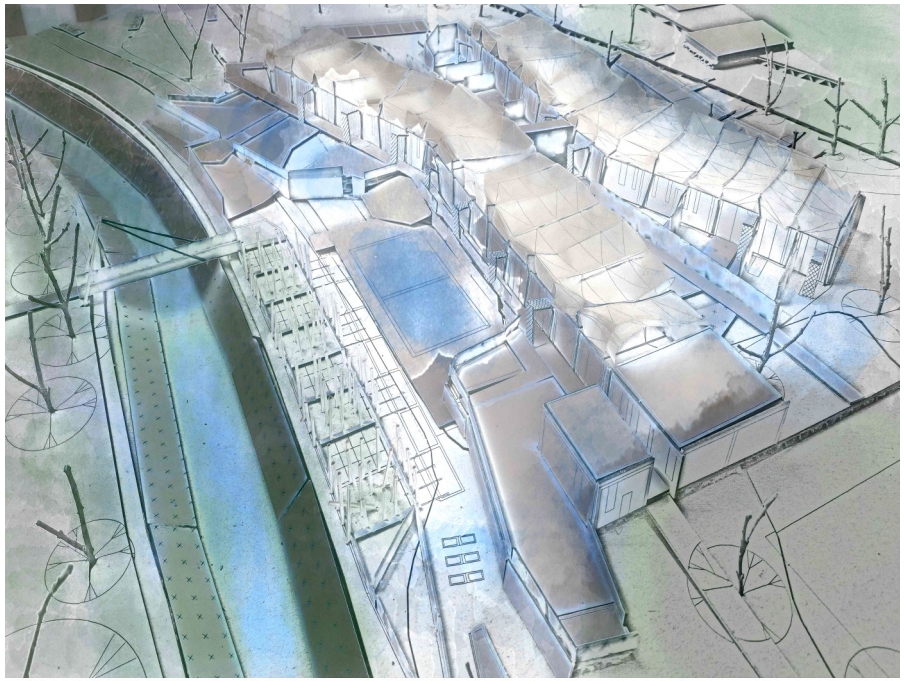
flowing forward

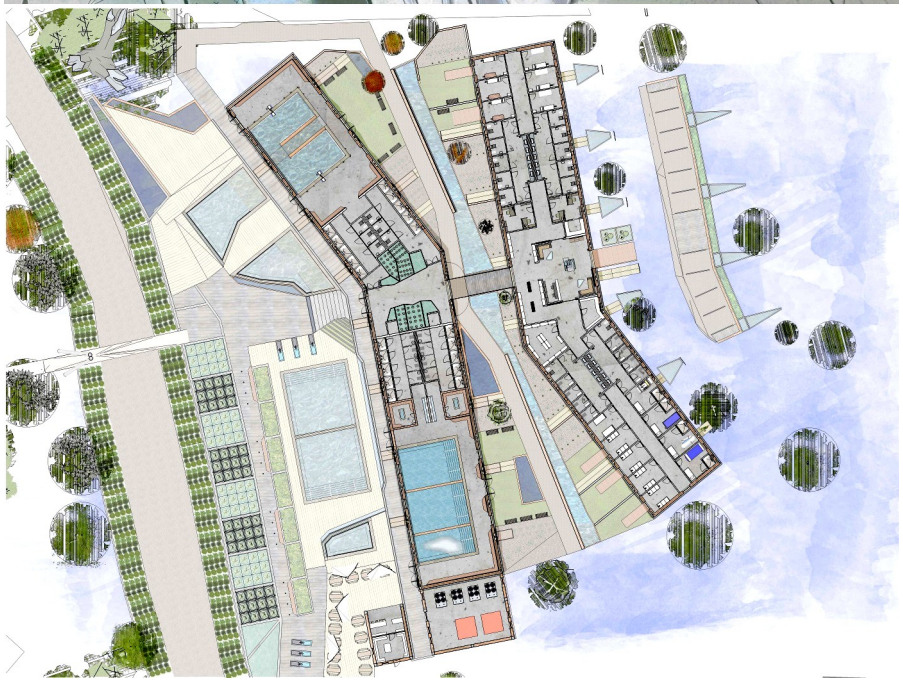
9.4 FINAL PRESENTATION

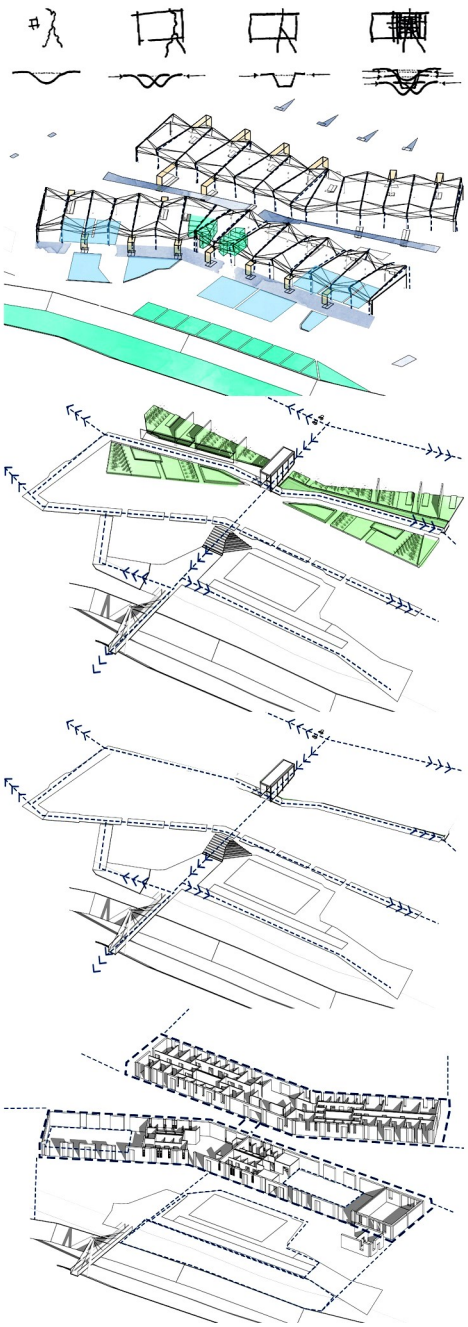


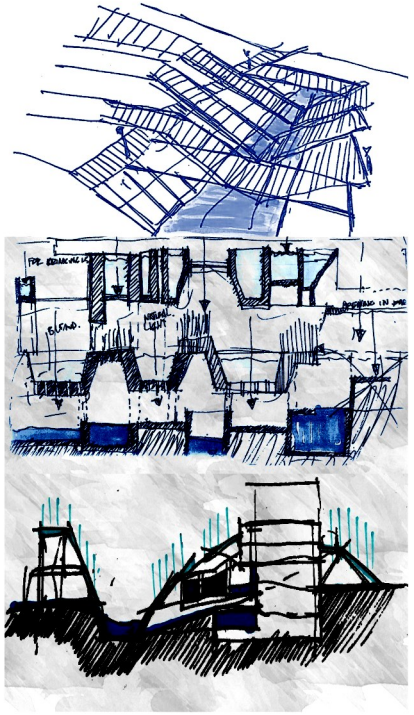


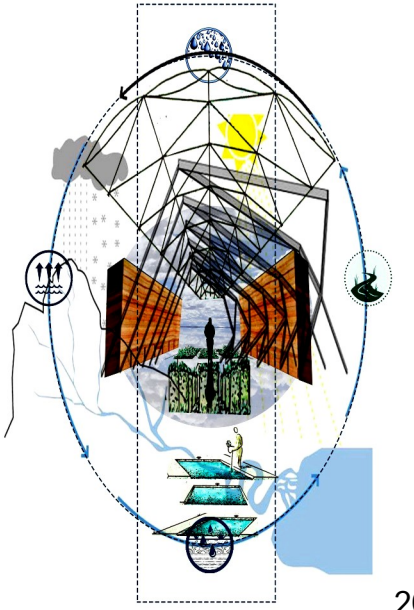
9.4 FINAL PRESENTATION

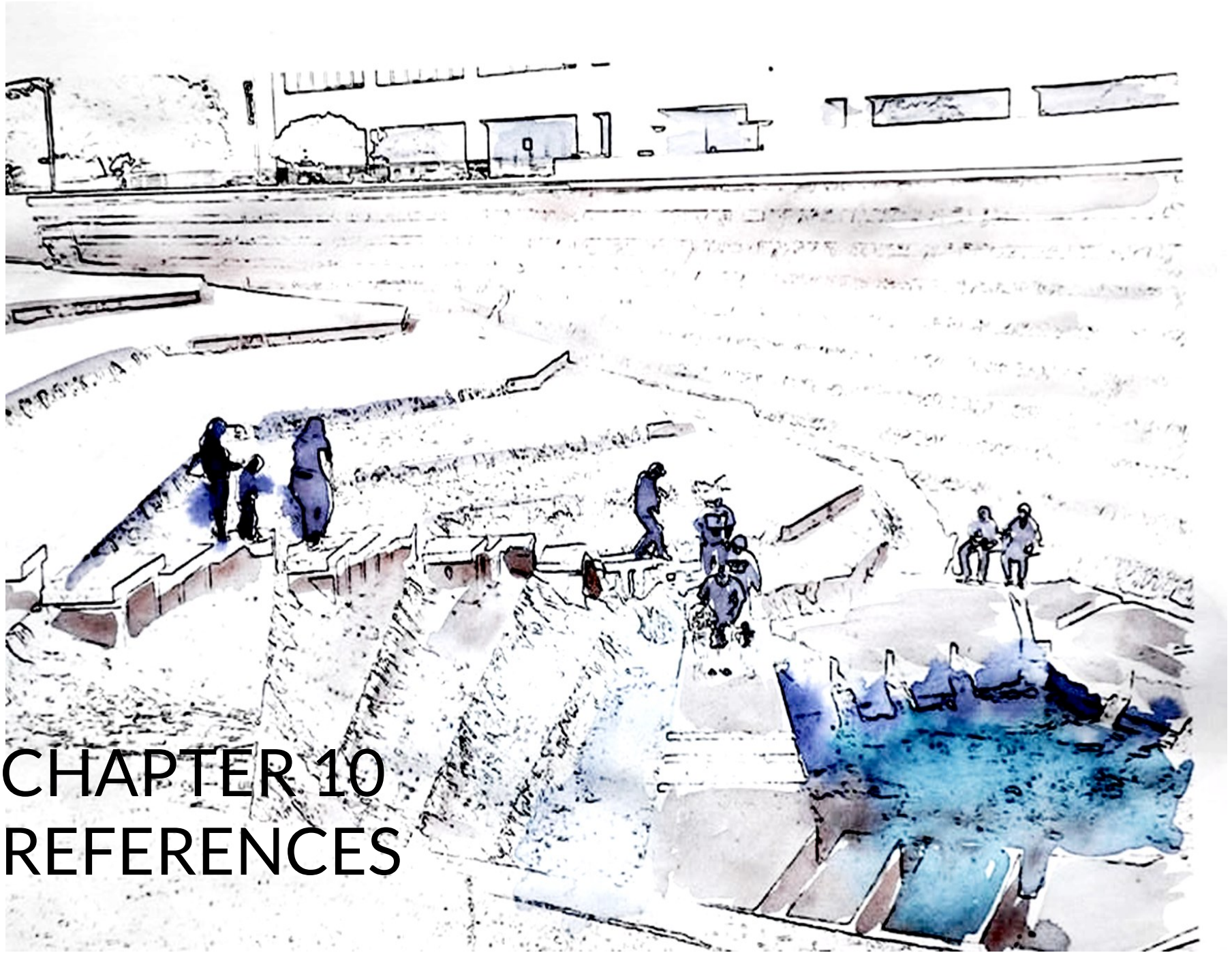












CHAPTER 10
REFERENCES

Figure 10.1. Adapted watercolour sketch. Author, 2016.

10.1 REFERENCES

BOOK SOURCES

Adeyeye, K., 2013. *Water Efficiency in Buildings: Theory and Practice.* West Sussex: John Wiley.

Campion, M.C., 1997. *Hydrotherapy: Principles and Practice*. New York, NY: Butterworth-Heinemann.

Castex, J. 2008. *An Architecture of Italy*. London: Greenwood Press.

Chittaranjan R., J. Ravi., 2014. *Low Cost Emergency Water Purification Technologies: Integrated Water Security Series.* New York, NY: Butterworth-Heinemann.

Ciancio, D., Beckett, C, 2015. *Rammed Earth Construction: Cutting-Edge Research on Traditional and Modern Rammed Earth.* New York, NY: Taylor and Francis.

De Meulder, B., Shannon, K. 2013. *Water Urbanisms East*. Berlin: Medialis.

Desonie, D. 2007. *Hydrosphere:* Freshwater Systems and Pollution. New York, NY: Chelsea House.

Dippenaar, M. 2013. *Hydrological Heritage Overview: Pretoria's Fountains - Arteries of Life.* Pretoria: Water Research Commission.

Dreiseitl, H., Grau, D. 2009. *Recent Waterscapes: Planning, Building and*
Designing with Water. Berlin: Birkhäuser.

Dunnett, N. Clayden, A. 2007. *Rain Gardens: Managing Water Sustainably in the Garden and Designed Landscape.* Portland, OR: Timber Press.

France, R.L. et al. 2002. *Handbook of Water Sensitive Planning and Design.* Boca Raton, FL.: CRC Press.

Grant, G. 2016. *The Water Sensitive City*. West Sussex: Wiley Blackwell.

Hawley, C., 2013. *Transitions: Concepts + Drawings + Buildings*. Surrey: Ashgate Publishing.

Hensel, M. Turko, J.P.2015. *Grounds and Envelopes: Reshaping Architecture and the Built Environment.* London: Routledge.

Jones, J.B., Stanley, E., 2016. *Stream Eco-systems in a Changing Environment.* London: Academic Press.

Kinkade-Levario, H., 2013. *Design for Water Rainwater Harvesting Stormwater Catchment and Alternate Water Reuse.* Gabriola Island: New Society.

LeCuyer, A., 2008. *ETFE: Technology and Design.* Basel: Birkhäuser.

Levitt, S. 2013. *Treatment of Cerebral Palsy and Motor Delay (5th Edition).* West Sussex: Wiley Publishers.

Margolis, L., Chaouni, A. 2014. *Out of Water: Design Solutions for Arid Regions.* Basel: Birkhäuser.

Marsalek et al., 2008. *Urban Water Cycle Processes and Interactions: Urban Water Series – UNESCO-IHP.* Paris CRC Press: Paris.

Mathur, A., Da Cunha, D. 2014. *Design in the Terrain of Water*. University of Pennsylvania, PY: Applied Research + Design Publishing.

Moore, C.W., Keim, K. 2004. *You Have to Pay for the Public Life: Selected Essays of Charles W. Moore*. Cambridge, MA: MIT Press.

Oliver, H.R., Oliver, S.A., 2013. *The Role of Water and the Hydrological Cycle in Global Change.* Berlin: SpringerScience.

Rael, R. 2009. *Earth Architecture*. New York, NY: Princeton Architectural Press.

Rodríguez-Iturbe,I., Rinaldo, A., 2001. *Fractal River Basins: Chance and*
Self-Organisation. Cambridge: Cambridge University Press.

Ryan, Z., 2010. *Building with Water: Concepts Typology Design.* Basel: Birkhäuser.

10.1 REFERENCES

BOOK SOURCES

Prominski, M.,Stokman, A., Zeller, S., Stimberg, D., Voermanek, H. . 2012. *River, Space, Design. Planning Strategies, Methods and Projects for Urban Rivers.* . Basel: Birkhäuser.

Smout, M., Allen, L., Smout, A. 2007. Pamphlet *Architecture 28: Augmented Landscapes.* New York, NY: Princeton Architectural Press.

Sedlack, D., 2014. *Water 4.0: The Past, Present, and Future of the World's Most Vital Resource.* New Haven, CT: Yale University Press.

Speed R. et al, 2016. *River restoration: a strategic approach to planning and management.* London: UNESCO Publishing.

Tilda, L., Blotstein, L., 2012. *Design Ecologies: Essays on the Nature of Design.* New York, NY: Princeton Architectural Press.

Wylson, A., 1986. Aquatecture: *Architecture and Water*. London: The Architectural Press.

Zevenbergen, C., Cashman, A., Evelpidou, N. Pasche, E., Garvin, S., Ashley, R. 2010. *Urban Flood Management*. Boca Raton, FL.: CRC Press.

ELECTRONIC PUBLICATIONS

ActionAid South Africa. 2016. *Running on Empty: What Business, Government and Citizens must do to confront South Africa's water crisis.* [Online]. Available from http://www.actionaid.org/sites/files/actionaid/running_on_empty_-_water_efficiency_report.pdf. (Accessed 25 March 2016).

ARUP, 2013. Arup's *City of Tshwane Masterplan*. [Online]. Available from http://www.arup.com/projects/tshwane_precinct_masterplan. (Accessed 14 March 2016).

CSIR. 2010. *A CSIR Perspective on Water in South Africa*. [Online]. Available from http://www.csir.co.za/nre/docs/CSIR%20Perspective%20on%20Water_2010.PDF. (Accessed 25 March 2016).

Department of Water Affairs. 2015. *2014-15. Annual National State of Water Resources report.*. [Online]. Available from https://www.dwa.gov.za/documents/AnnualReports/ANNUAL%20REPORT%202014-15.pdf). (Accessed 18 February 2016).

GAPP Architects and Urban Designers, 2009. *Mandela Development Corridor Urban Design Framework Review.* [Online]. Available from http://www.tshwane.gov.za/sites/Residents/Services/Documents/45.%20Item%2045%20Approval%20of%20the%20Mandela%20Development%20Corridor.pdf. (Accessed 24 February 2016).

Lohan, E., Kirskey, W., 2012. *Ecosystems as Infrastructure*. www.livingmachines.com. [Online]. Available from (Accessed 4 August 2016).

Kovacs, Z. 1978. *Documentation of the January, 1978 floods in Pretoria and in the Crocodile River catchment.* [Online]. Available from https://www.dwa.gov.za/iwqs/reports/tr TR88_Kovacs_1978_Documentation_of_the_January_1978_floods_in_Pretoria_and_in_the_Crocodile_River_catchment.pdf. (Accessed 14 March 2016).

Reed, B. 2015 . *Regenerative Development Living Systems Practice – Healing the World in 18 Months.* Presentation at the International Living Future Institute's Ninth Annual Living Future unConference, April 1-3, Sheraton Hotel Seattle, Seattle, Washington, DC. [Online]. Available from https://www.ecobuilding.org/conference/previous-years/presentation-files/2015-presentations/bill-reed-regenerative-development. (Accessed 5 April 2016).

Swanepoel, R. 2013. *Hove's Drift*. [Online]. Available from http://repository.up.ac.za/bitstream/handle/2263/21275/Pta%2013-04.pdf?sequence=1. (Accessed 2 February 2016).

UN Water, 2015. *The United Nations World Water Development Report*. [Online]. Available from https://www.unesco-ihe.org/sites/default/files/wwdr_2015.pdf. (Accessed 14 March 2016).

10.1 REFERENCES

INTERNET SOURCES

Casagrande Laboratory: Centre for Urban Research. 2016. *Guandu River City*. [Online]. Available from http://www.casagrandelaboratory.com/portfolio/guandu-river-city/. (Accessed 16 April 2016)

Charles Moore Foundation. 2016. *Princeton Dissertation, Water and Architecture*. [Online]. Available from http://charlesmoore.org/photos/5016/. (Accessed 2 September 2016).

CSIR. 2010. *A CSIR Perspective on Water in South Africa*. [Online]. Available from http://www.csir.co.za/nre/docs/CSIR%20Perspective%20on%20Water_2010.PDF. (Accessed 25 March 2016).

Glossary of Useful Water Research Terms. The D.C. Water Resources Centre, University of Columbia, 1983. [Online]. Available from http://www.udc.edu/docs/dc_water_resources/technical_reports/report_n_50.pdf. (Accessed 12 May 2016).

Grobler, N. 2015. *Fear of sewage spillage of Apies River*. [Online]. Available from http://citizen.co.za/415633/fear-of-sewage-spillage-in-apies-river/. (Accessed 15 February 2016).

RegenesisGroup. 2012. *Story of Place*. [Online]. Available from http://www.regenesisgroup.com/wp-content/uploads/2016/02/Designing-From-Place-w_-appendix12_11.pdf. (Accessed 28 February 2016).

Water Sustainability of agribusiness activities. 2016. [Online]. Available from http://www.unepfi.org/fileadmin/publications/water/chief_liquidity1_South_Africa.pdf. (Accessed 19 February 2016).

Jacobs, K., 2015. *Letter from Los Angeles: Reviving the River*. [Online]. Available from http://www.architectmagazine.com/design/urbanism-planning/letter-from-los-angeles-reviving-the-river_o. (Accessed 7 March 2016).

Krone, C, 2015. *Living Systems Thinking*. [Online]. Available from https://www.ecobuilding.org/conference/previous-years/presentation-files/2015-presentations/bill-reed-regenerative-development. (Accessed 5 April 2016).

Wilson, A. 2013. *ETFE Foil: A Guide to Design*. [Online]. Available from https://en.wikiarquitectura.com/index.php/Baths_of_Caracalla. (Accessed 3 August 2016).

JOURNALS

Castle, H., Pallasmaa, J. et al. 2016. *Inhabiting time*. Architectural Design, 239(1): 50-59.

ONLINE DISSERTATIONS AND THESES

Ahlers, T. 2006. *A concept constructed wetland for the Pretoria Central Business District*. Tshwane University of Technology. [Online]. Available from http://encore.tut.ac.za/iii/cpro/app?id=2915877822452517&itemId=1000824&lang=eng&service=blob&suite=def. (Accessed 15 February 2016).

Dunn, S. 2012. *The Center for Environmental Therapeutics*. University of Oregon: U.S.A. [Online]. Available from https://issuu.com/sethdunn/docs/thesis_proposal_final.small (Accessed 3 March 2016).

Myburgh, A. 2014. *Fountains Valley: The origins of a City*. University of Pretoria: Pretoria. [Online]. Available from http://www.repository.up.ac.za/dspace/handle/2263/45305. (Accessed 7 March 2016).

Noor, A. 2015. *Rejuvenation Centre: A threshold from industrial to natural realm*. Unitec Institute of Technology: Auckland, New Zealand. [Online]. Available from http://unitec.researchbank.ac.nz/handle/10652/3283. (Accessed 1 June 2016).

Rust, E.S. 2011. *Healing Waters: Creating Therapeutic Space*. University of Cape Town: Cape Town. [Online]. Available from https://open.uct.ac.za/handle/11427/5996. (Accessed 5 May 2016).

10.1 REFERENCES

ONLINE JOURNALS

Mang, P., Reed, B., 2011. *Designing from Place: a regenerative framework and methodology. Building Research & Information* , 40(1): 23-38. [Online]. Available from http://www.tandfonline.com/loi/rbri20. (Accessed 7 February 2016).

Nel, J., Roux, D.J., Maree, G., Kleynhans, C.J., Moolman, J., Reyers, B., Rouget,M., Cowling, R.M. 2007. *Rivers in peril inside and outside protected areas: a systematic approach to conservation assessment of river ecosystems.* 13(5) : 341-352. [Online]. Available from https://www.researchgate.net/figure/227658963_fig4_Figure-4-Ecosystem-status-of-main-rivers-in-South-Africa-based-on-the-extent-of. (Accessed 19 April 2016).

ONLINE VIDEOS

Dippenaar, M. 2015. *Pretoria's Water Supply, History and Heritage*. [Online]. Available from https://www.youtube.com/watch?v=LrwfBFGEpQ0. (Accessed 12 February 2016).

Water Research Commission. 2015. *The Hydrological Heritage overview:*
Pretoria's Fountains-Arteries of Life. https://www.youtube.com/watch?v=0_XZEVUoymk. (Accessed 16 March 2016).

OTHER

Van der Waal Collection, 1999**.** *Timeline of the Apies River*. University of Pretoria.

Pretoriana Collection, 2016. *Pretoria 50 years ago*. University of Pretoria.

Rosa Swanepoel Collection, 2008. *Pretoria Picture Gallery*. University of Pretoria.

UNEP FI. See United Nations Environment Programme Finance Initiative.

WWAP. See United Nations World Water Assessment Programme.

PERSONAL COMMUNICATION

Thabethe, M., 2016. Site superintendent, Netcare Femina Hospital, personal interview, 25 April, Pretoria.

UNPUBLISHED REPORT

Erasmus, A., Kelly, S., Mavrakis, A., Nicolaides, C., Scholtz, J. & Taylor, R. 2016. *Pretoria's Urban Water Framework.* Unpublished report compiled during coursework for Master's in Architecture (Professional) degree at the University Pretoria.

WEBSITES

American Society of Landscape Architects, 2010. Alchemy of an urban estuary: Jones River Falls. [Online]. Available from https://www.asla.org/2010studentawards/293.html. (Accessed 5 May 2016).

American Society of Landscape Architects, 2013. Los Angeles River Restoration. [Online]. Available https://www.asla.org/2013awards/198.html. (Accessed 15 February 2016).

An Overview of Ecological Wastewater Treatment. 2015. [Online]. Available from http://www.nuecological.com/how-does-it-work/. (Accessed 24 March 2016).

Archdaily, 2014. Zhangjiagang Urban River Restoration. [Online]. Available from http://www.archdaily.com/563128/zhangjiagang-town-river-reconstruction-botao-landscape. (Accessed 15 February 2016).

Darling, T., 1964. Fallingwater House by Frank Lloyd Wright in Pennsylvania. [Online]. Available from http://www.amnesta.net/other/fallingwater/. (Accessed 30 June 2016).

Daylight Yonkers. 2016. [Online]. Available from http://daylightyonkers.com/daylighting-facts/. (Accessed 11 February 2016).

10.1 REFERENCES

WEBSITES (cont.)

DeltaStudioArchitecture, 2016. *Albula.* [Online]. Available from www.deltastudioarchitecture.com/albula/ (Accessed 6 September 2016).

Ecological Engineering and Design . n.d. *How Does it Work? An Overview of Ecological Wastewater Treatment.* [Online]. Available from http://www.nuecological.com/how-does-it-work/. (Accessed 24 March 2016).

Erdman, R., 1964. Amantes Fountain in Mexico by L. Barragán. [Online]. Available from http://richarderdmanstudios.tumblr.com/post/59784713080/unavidamoderna-fuente-de-los-amantes-los. (Accessed 30 June 2016).

Estudio Sampere, 2011. Manzanares River, Madrid. [Online]. Available from http://mividaen.sampere.com/madrid-rio-the-park-of-the-manzanares-river. (Accessed 18 February 2016).

EstudoPrévio, 2009. St. Peter's Church in Sweden by Sigurd Lewerentz. [Online]. Available from http://www.estudoprevio.net/en/papers/46/dossier-teses-joao-ortigao-ramos-.-building-a-temple-sigurd-lewerntz-three-case-studies. (Accessed 15 July 2016).

ETFE Roof Construction, 2013. [Online]. Available from http://www.architen.com/articles/etfe-foil-a-guide-to-design/. (Accessed 14 August 2016).

Friends of the Liesbeek. n.d. [Online]. Available from www.fol.org.za. (Accessed 7 March 2016).

Groundwork Hudson Valley. n.d. *Daylighting the Saw Mill River*. [Online]. Available from http://www.groundworkhv.org/programs/rivers-and-trails/daylighting-the-saw-mill-river/. (Accessed 6 October 2016).

Hydrological Cycle. 2010. [Online]. Available from http://www.sciencevsaging.org/node/425. (Accessed 12 July 2016).

John Todd Ecological Design. 2016. [Online]. Available from http://www.toddecological.com/index.php?id=projects. (Accessed 3 March 2016).

Joslin, A., 2011. Brion-Vega Cemetery in Italy by Carlos Scarpa. [Online]. Available from https://dome.mit.edu/handle/1721.3/68174. (Accessed 5 July 2016).

Leça Swimming Pools . [Online]. Available from http://www.galinsky.com/buildings/leca/ (Accessed 29 June 2016).

Linton J., 2014. The Hydrologic cycle by Robert. E Horton. [Online]. Available from http://sciencevsaging.org/fr/node/425. (Accessed 1 April 2016).

Los Angeles River Revitilisation. 2015. [Online]. Available from http://www.lariver.org/projects-overview. (Accessed 16 February 2016).

Mason's Bend Community Center. 2010. http://forrestfulton.com/masons-bend-community-center/.[Online]. Available from (Accessed 1 October 2016).

Matheus, E. 2011. *Regenerative Water Cycle*. [Online]. Available from http://www.estebanmatheus.com/regenerative-water-cycle/. (Accessed 2 March 2016).

McCusker, V., 2013. Global water footprint. [Online]. Available from https://gdblogs.shu.ac.uk/b2001642/2014/10/19/ts-another-example-of-our-global-footprint/. (Accessed 24 April 2016).

Mehaffy, M. & Salingaros, N., 2013. Hierarchical organisation vs. resilient distributed nodal network. [Online]. Available from http://www.theecologist.org/green_green_living/2234983/the_biological_basis_of_resilient_cities.html. (Accessed 1 April 2016).

Meinhold, B. 2013. *Herzog & de Meuron's Naturbad Riehen Natural Swimming Pool Breaks Ground in Switzerland.* [Online]. Available from http://inhabitat.com/herzog-de-meurons-naturbad-riehen-natural-swimming-pool-breaks-ground-in-switzerland/. (Accessed 1 September 2016).

10.1 REFERENCES

WEBSITES (cont.)

Onderstall,N., 2013. Hydrating Liesbeek Valley Park. [Online]. Available from http://nikkionderstallportfolio.blogspot.co.za/2013/05/hydrating-liesbeek-valley-park_27.html. (Accessed 29 June 2016).

Rehab Basel, Herzog & de Meuron. 2013. [Online]. Available from https://tanczostibor.wordpress.com/2013/05/27/rehab-basel-herzog-de-meuron/ (Accessed 29 August 2016).

Rome, Baths of Caracalla, 2015. [Online]. Available from http://www.livius.org/articles/place/rome/rome-photos/rome-baths-of-caracalla/ (Accessed 29 June 2016).

Fullerton, J. 2015. Regenerative Economies for a Regenerative Civilization. [Online]. http://www.kosmosjournal.org/article/regenerative-economies-for-a-regenerative-civilization/. (Accessed from 2 April 2016).

Saw Mill River Coalition. 2011. [Online]. Available from http://www.sawmillrivercoalition.org/whats-happening/daylighting-the-saw-mill-river-in-yonkers. (Accessed 11 February 2016).

Teleton Hydrotherapy Centre. 2015. [Online]. Available from http://www.architectural-review.com/today/spinal-injury-rehabilitation-centre-asuncin-paraguay-by-gabinete-de-arquitectura/8652208.fullarticle. (Accessed 12 May 2016).

Teleton Rehabilitation Centre. 2014. [Online]. Available from https://arch.iit.edu/img/468a4a9f19874e52/27307pr120412-127d.jpg. (Accessed 12 May 2016).

The Huffington Post. 2013. 2013's Notable Developments in Landscape Architecture. [Online]. Available from http://www.huffingtonpost.com/charles-a-birnbaum/2013s-notable-development_b_4383816.html. (Accessed 12 May 2016).

United Nations Environment Programme Finance Initiative. 2009. Water Sustainability of Agribusiness Activities. *Chief Liquidity Series: Water-Related Materiality Briefings for Financial Institutions*, 1, October: 42-48. [Online]. Available from http://www.unepfi.org/fileadmin/publications/water/chief_liquidity1_South_Africa.pdf. (Accessed 19 February 2016).

United Nations World Water Assessment Programme. 2015. *The United Nations World Water Development Report 2015: Water for a Sustainable World*. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO). [Online]. Available from https://www.unesco-ihe.org/sites/default/files/wwdr_2015.pdf. (Accessed 14 March 2016).

US Environmental Protection Agency. 2016. *The Urban Waters Cycle*. [Online]. Available from https://www.epa.gov/urbanwaters/urban-waters-cycle. (Accessed 16 September 2016).

Warka Water Tower Concept. 2015. [Online]. Available from http://www.warkawater.org/design. (Accessed 5 August 2016).

Watertalk: Killing The Colorado. 2015. [Online]. Available from https://medium.com/@ProPublica/how-do-we-meet-our-21st-century-water-needs-e4c6ca5b071d#.353wdkr6x (Accessed 16 April 2016).

Wang, L. 2016. *Open-Source Phytoremediation Project Tackles the Tiber River's Pollution Crisis*. [Online]. Available from http://inhabitat.com/open-source-phytoremediation-project-tackles-the-tiber-rivers-pollution-crisis/. (Accessed 5 October 2016).

Wikiarquitectura. 2015. *Baths of Caracalla*. [Online]. Available from https: en.wikiarquitectura.com/index.php/Baths_of_Caracalla. (Accessed 9 October 2016).

ZECB Proposal. 2015. [Online]. Available from https://sites.google.com/site/zeroenergyconceptbuilding/. (Accessed 29 June 2016).