

# Constructing an Ecological Civilization

## 建设一种生态文明

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As cities grow larger and larger, their connections with other urban areas lead to networked regions that share economies and ecologies, and often a central vision. These regions have become known as “megaregions.” In China, there are three megaregions – the Yangtze River Delta, the Pearl River Delta, and Jing-Jin-Ji. Encompassing Beijing, Tianjin, and Hebei Province in north-eastern China, the Jing-Jin-Ji megaregion was the subject of a recent interdisciplinary study and studio at Weitzman School of Design. This essay describes the landscape findings of that endeavor.

Successful megaregions have several key characteristics: they are economic powerhouses offering a wide range of employment opportunities; they are well connected in terms of transportation and communication systems; they present a range of housing and lifestyle options from dense inner-city zones to open peri-urban and rural landscapes; and they are political and cultural hubs serving, ideally, as incubators of innovation. But none of these are possible unless the megaregion is embedded in a healthy natural environment. While scholarship and policy related to megaregions typically focus on urban areas, it is the surrounding landscape that ultimately underpins and sustains a megaregion, offering benefits to citizens in the form of clean air, water, and food. Therefore, as China’s central government moves to construct and link the urban fabric of the Jing-Jin-Ji megaregion, it must also undertake the restoration of the region’s depleted landscapes.

The Jing-Jin-Ji landscape faces an interconnected set of problems concerning air and water quality, multiple forms of pollution, loss of habitat, loss of productive soil, and depletion of the groundwater supplies. Air pollution is perhaps the most visible and well-known environmental problem facing Jing-Jin-Ji. On the calendar day marked as the most severe in the last few years, the concentration of PM2.5 rose to 50 times the accepted healthy limit. Cities at the southern end of the Hebei Province are particularly affected by air pollution and, as a result, ailments connected to air quality are widespread and life expectancies are lower here than the national average. The most significant factors contributing to such levels of pollution are coal-fired power stations, outdated industrial practices, coal-based domestic heating, and growing vehicle ownership.

Water scarcity and pollution are also critical concerns in the Jing-Jin-Ji megaregion. The major rivers and riparian zones that traverse the megaregion from east to west are polluted and ecologically dysfunctional. The megaregion has limited surface water, much of which is polluted by the expansion of impervious surfaces and a lack of storm-water-related controls. The lack of surface water and the poor quality of this water has recently been addressed by the South–North Water Transfer project, which brings water from the water-rich south to the arid north. However, taking from the south to give to the north is not a viable long-term solution to national water scarcity. In Jing-Jin-Ji, the aquifer is being depleted across the region, so much so that in places the land and related infrastructure is subsiding. Much of the groundwater and surface water quality is poor due to pollution from agricultural and industrial sources. The Bohai Bay—the region’s main coastal resource and receiving environment for the region’s catchment—presents twin issues: critical levels of pollution and the looming reality of sea level rise. Sea level rise will significantly complicate Tianjin’s port-related logistics and throws current regional plans, which emphasize further rapid development along the coastal belt, into question.

The megaregion’s population growth is paired with sprawled and disorderly urban and suburban development that consumes arable land, destroys remnant habitat, and

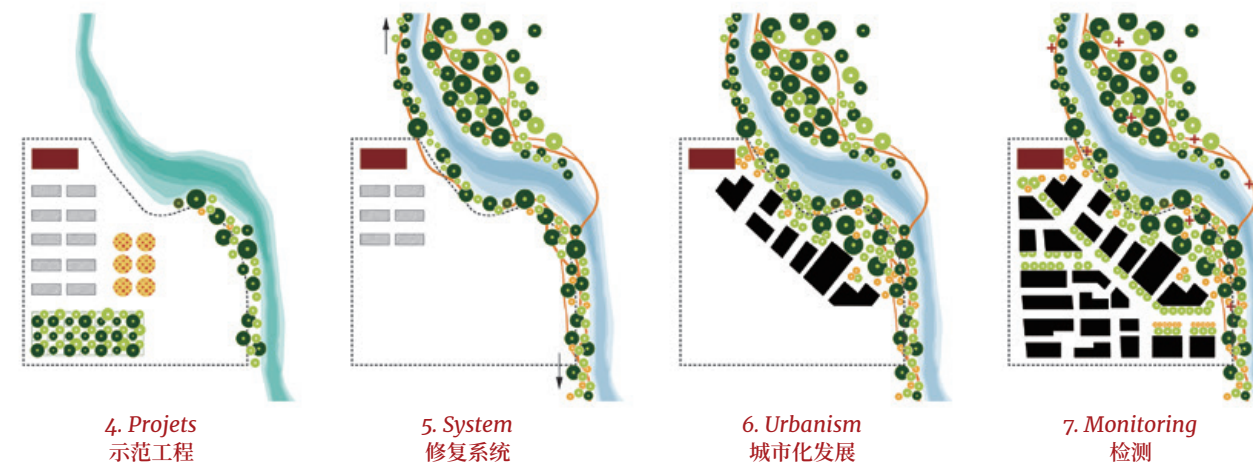
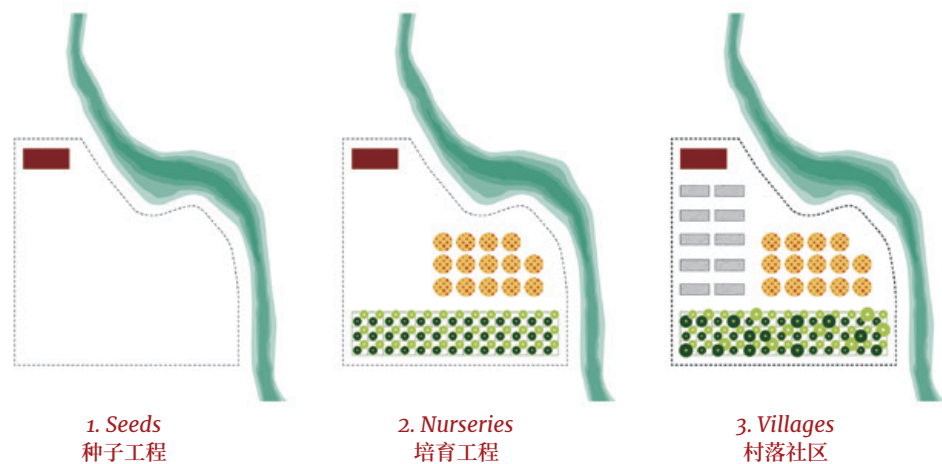
随着城市的不断扩张，城市之间的连接将形成由中心城市开始辐射的共享经济与生态的城市网络。这些区域往往被称为“大城市群”。在中国有三个大城市群，分别是长三角区域，珠三角区域与京津冀区域。覆盖了中国东北部的北京，天津与河北省的京津冀大城市群是宾夕法尼亚大学威兹曼设计学院一个跨学科核心设计课的研究主题。本文将描述在这一主题下京津冀大城市群的景观学发现。

一个成功的大城市群往往有几个重要特征：拥有能提供大量不同工作岗位的经济体；拥有完善的交通与通讯网络；能提供由密集中心城区，低密度郊区到农业景观的一系列不同的居住与生活方式的选择；在城市群中存在区域政治或文化中心，理想化来说，存在创新孵化中心。但如果缺乏一个健康的自然环境基础，这些特性都不可能会存在。当学术研究与发展决策往往关注与城市化区域时，其实是城市周边的景观空间在不断支持与巩固中心区域的发展，为城市居民提供新鲜的空气，水和食物。因此，当中国的中央政府投入建设与连接京津冀大城市区时，它必须同时投入于区域中日渐恶化的景观环境的修复之中。

京津冀的景观环境面临着一系列相互关联的生态问题，包括空气与水的质量问题，多种污染问题，栖息地的丧失，土壤肥力的丧失和地下水供给的减少。其中空气污染也许是最为可见与广为人知的一个环境问题。在过去几年空气污染最严重的日子里，空气中PM2.5的含量已经达到了不影响人体健康PM2.5浓度极限的50倍。河北省南部的城市受空气污染的影响最为严重，与空气污染相关的疾病在这些城市中十分常见，并且这些城市的人均寿命也低于国家平均水平。造成如此严重的空气污染的成因包括了大量的火力发电站，落后的工业生产方式，以煤炭燃烧为暖气来源的供暖系统和不断增长的私家车使用。

水资源的匮乏与污染问题也是京津冀区域的一个主要生态问题。由东至西穿越过整个大城市区域的主要河流与河流沿岸区域都受到了一定程度的污染，其生态功能也受到了损害。京津冀生态区有着非常有限的地表水资源，并且大部分地表水由于区域中不断增加的不可渗透表面的增加与雨洪管理设施的缺乏受到了污染。近年来，地表水的缺乏与污染问题被南水北调

The JERA process  
京津冀生态保护管理委员会



工程所缓解,即从中国南部水资源充沛的区域输送水资源到干涸的北部。

大城市群的人口增长往往伴随着城市与城市郊区的蔓延与无秩序发展,这些发展往往会侵蚀可耕种的土地,剩余的生物栖息地和形成排水系统的硬化与渠化。可耕种土地与森林的减少给京津冀区域带来了以下几个负面影响,其中包括土壤的盐化,酸化,水土流失与沙尘暴,这些负面影响会进一步的影响土壤质量与农业产出。贫困农业地区传统的农业耕作方式与经济压力也同样造成了土壤质量进一步恶化与水体的富营养化。除此之外,在经过了30年的持续快速城市化之后,该区域的生物多样性已经显著减少。除了山区以外,京津冀地区也明显缺乏具有一定规模的可自给自足的生态保护区域和景观连接通道。

因此,为了保护与修复具有生物多样性的栖息地,从而为京津冀地区提供更高质量的空气和水与旅游休闲活动资源,我们能做些什么呢?通过研究,我们假设建立了一个新的政府部门——京津冀生态保护管理委员会(JERA),该组织通过将一套新的生态系统整合到

mechanizes drainage patterns. The loss of arable and forestland has brought several negative repercussions to the region, including soil salination, erosion, aridity, and sandstorms that further affect the quality of the soils and the agricultural yields. Low-tech agricultural practices and economic stress on the rural poor also result in land degradation and eutrophication of waterways. Additionally, after almost 30 years of sustained rapid urbanization, the region's biodiversity has suffered significant losses and is now virtually devoid of viable protected areas and forms of landscape connectivity on a meaningful scale, except for mountainous hinterlands.

So, what can be done to protect and restore biodiverse habitats to provide for improved air and water quality and recreation opportunities for residents of the Jing-Jin-Ji megaregion? Our study proposed the establishment of a new government department—the Jing-Jin-Ji Eco-Region Authority (JERA)—with the mandate to reconstruct ecological functionality on a megaregional scale and integrate this new ecology with urban development and

infrastructure. It was proposed that JERA would be guided by three overarching aims: first, to articulate and manifest the ideals of ecological civilization as a transformative cultural and ecological project of historical significance to China and the world; second, to reconstruct a functional ecosystem at the Jing-Jin-Ji megaregional scale: one that delivers the fundamental ecological services of clean air, clean water, and clean food and one which significantly enhances the biodiversity of the region and provides natural amenity, beauty, and security for all the citizens and species of the Jing-Jin-Ji; and third, to integrate the reconstruction of the Jing-Jin-Ji megaregion's ecosystem with urban development and its associated infrastructures. JERA's method for reconstructing the Jing-Jin-Ji megaregion's ecosystem would be achieved through the seven steps described below.

### Step 1: Seeds

The “seeds” are small ecological research and design laboratories established in strategic sites throughout the

城市的发展与基础建设之中,来重建京津冀地区的生态功能。JERA的工作将被统领于三个相互交叉的目标之下:第一,声明与强调生态文明是一个关系到中国和世界文化转变的重要生态工程;第二,为京津冀区域的居民和生物,重建一套既能够提供新鲜的空气,水,安全的食物,又能够有效的增加区域的生态多样性和提供自然风景,休闲活动和安全的基础生态服务设施;第三,整合京津冀区域的生态系统重建工作到城市的发展和基础设施的建设中。JERA重建京津冀地区的生态系统的目标将有以下描述的七个步骤来实现。

### 第一步:种子工程

种子工程是在京津冀地区范围内的七个景观类型区域中选择出来的战略性场地所设置小型生态研究与设计实验室。这些种子工程的选址的确定是因为他们能够代表京津冀地区的生态多样性情况。每个种子工程分别提供驻地的生态学家,工程师,规划师与景观师团队分别从事数据收集和JERA生态修复工作的实验项目的工作。每个种子工程作为生态修复工作的总部进行研究,设计,并在“种子”的“种植”阶段,最终从



事生态修复工作的实际操作。这些种子工程同时也将作为文化中心来保持JERA与周边社区信息的交换,使JERA能够不断从实践中汲取经验并不断对自身的工作进行检测与自我修正。这些种子工程会与全球范围内参与京津冀生态系统修复工作的高校与咨询顾问保持密切的交流,形成全球第一个与最大的生态区域重建活动。

### 第二步:培育工程

在种子工程周边的开放空间,培育工程将培养所有的植物和储存所需的材料,来满足在周边进行的JERA生态修复工作的需要。通过这种方式,植物的储存量将在场地内达到保证,并且这些植物将适应于当地的微气候。这些培育工程也将为当地希望同步参与到JERA生态修复工作中的社区提供植物材料和项目建议。

### 第三:村落社区

村落社区是与种子工程与培育工程相连接的,所有JERA的职工可以接受培训的区域,如果职工不来自于当地的社区,职工们也可以居住在村落社区中。这些村落社区的结构与设计与中国许多的大型基建项目的工人社区相似。

### 第四步:示范工程

示范工程是建立于第一级种子——培育——村落社区系统周边的工程范本,并且将在尺度上不断增加成为实际的生态修复工程。由于京津冀地区大部分自然景观都已被开发或在某种程度经过了人为的改造,所以这些示范工程将成为理解何种生态修复技术能够在区域的特定环境下成功的最好的试验场所。当一个项目完成时,种子——培育——村落社区系统将移动到下一个修复场地,循环以往,直到所有示范工程能够共同形成一个连贯的景观系统。

### 第五步:修复系统

京津冀修复系统将整合所有单独的修复项目形成一个在更大尺度上的具有弹性的景观网络。当一个单

seven landscape types of the entire Jing-Jin-Ji megaregion. The locations for the seeds are chosen because together they represent the diversity of ecological conditions found in the Jing-Jin-Ji megaregion. Each seed provides the onsite infrastructure for teams of ecologists, engineers, planners, and landscape architects to work together on gathering the data and creating the pilot projects for JERA's ecological restoration work. Each seed functions as the headquarters for the research, the design, and ultimately the works required to reconstruct the ecosystem in which the seed is “planted.” The seeds would also function as cultural centers relaying information between JERA and surrounding communities, enabling JERA to “learn by doing” and to constantly monitor and self-correct its methods. The seeds would be connected to a global network of universities and consultants all involved in the Jing-Jin-Ji restoration project – the world's first and largest single attempt to reconstruct an entire ecoregion.

### Step 2: Nurseries

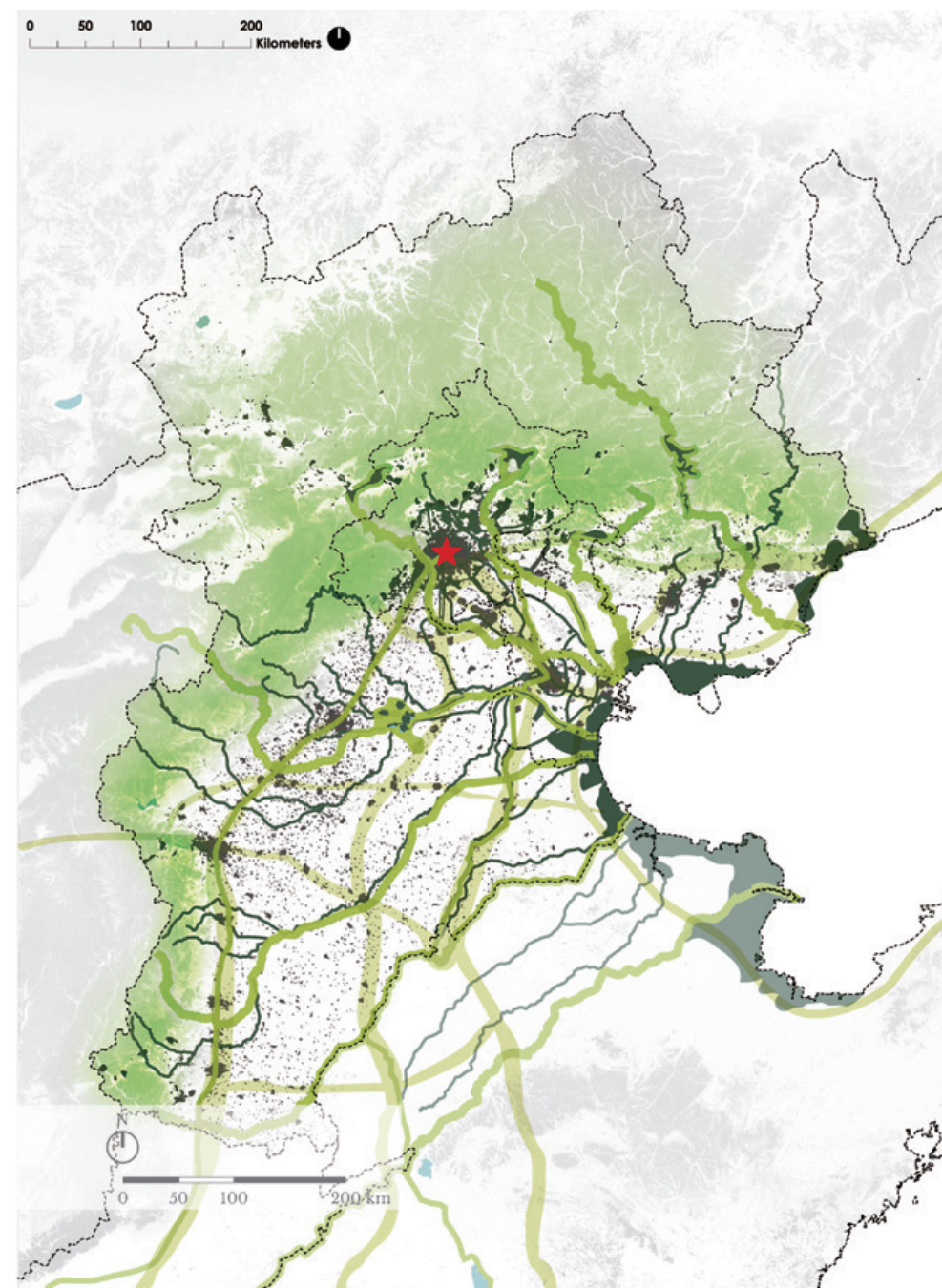
The nurseries, sited in open space adjacent to the seeds, would cultivate all the plants and store other materials required for the JERA ecological restoration project that will take place in the surrounding land. In this way, plant stock is hardened in situ and can adapt to local microclimatic conditions. The nurseries would also provide plant material and advice to local community groups wishing to undertake their own projects of ecological restoration in synch with JERA's work.

### Step 3: Villages

The villages are connected to the seeds and the nurseries and are where JERA employees are educated in landscape restoration techniques and where they can live if they are not from the local community. The villages are designed and constructed similarly to worker camps, typical to major construction projects in China.

### Step 4: Projects

The projects are demonstration sites established nearby the primary seed-nursery-village complex, which begin



JERA 通过生态修复创造相互联系的景观网络格局

The JERA process aims to create an interconnected landscape matrix.

独的生态修复项目的上游或周边区域有着不匹配的土地利用方式时, JERA发起的修复工作将无法达到最好的效果。所以, 应将每一个修复项目置于更大的生态网络中考量和更大的生态系统中评价其修复效益。

### 第六步: 城市化发展

这是一个城市化发展的阶段, 指的是由JERA建议的区域中能够在生态价值, 社会价值与经济价值上与修复后的景观互相促进的城市化发展机会和提出的城市设计导则。这些城市化发展将利用周边修复后景观所形成的具有良好生态服务功能的健康生态系统和公众休闲空间的价值来指导城市开发利用。

### 第七步: 检测

为了更好的理解区域内的景观绩效, JERA生态修复工程所发起的种子工程也将作为京津冀地区未来长期的景观生态监控中心。通过持续的观察, JERA将建立完善的询证生态修复知识系统, 同时也能够帮助中国与世界其它地区希望进行类似生态重建工作的区域。

### 结论

近年来, 中国的城市化进程在很大程度上排除了对生态问题的考虑。但是, 随着中国景观专业的发展, 这种情况正在改变。人们的环境意识正在不断增强, 景观生态学和人类健康与城市形态的设计和建造之间的联系日益受到重视。生态文明和美丽中国的概念重申了这种环境意识, 同时, 相关政策也使这些概念不仅仅停留于理论阶段。随着21世纪的到来, 中国有能力开展国家尺度上的生态修复计划, 以恢复其具有悠久历史的景观环境的健康和活力。而本文中提出的方案也是宾夕法尼亚大学韦茨曼设计学院的学生和教师, 以京津冀大城市群为例, 对此类大型生态修复项目应如何启动与管理的一种畅想与建议。

to phase-in the actual restorative work at scale. Because almost the entire landscape of the Jing-Jin-Ji is already heavily developed or modified in one way or another, these demonstration projects are important testbeds for understanding which restorative techniques will succeed in particular situations. As the projects take shape, JERA stays one step ahead coordinating land resumption and removing incompatible land uses by way of preparing future sites for the restorative work. When a project is completed, the seeds, nurseries, and villages move to their next location, and so on, until the projects can be strung together into coherent landscape systems.

### Step 5: Systems

The systems are formed by joining together smaller individual projects into larger more resilient landscape networks. It makes little sense to restore a site here when either upstream or adjacent to it are incompatible land uses that will negate the restorative work that JERA has started. In this sense, each individual project has to be tied into a larger network or system of restorative measures.

### Step 6: Urbanism

This is the development phase, where JERA identifies development opportunities and oversees urban designs, which are coupled with the restored landscapes in a way that is ecologically, socially, and economically compatible. These developments will derive value from the restored landscape and public amenity of a functional, healthy ecosystem in the immediate vicinity.

### Step 7: Monitoring

The seeds with which JERA’s ecological restoration project began also function as monitoring centers for better understanding landscape performance over the long term. Through the process of constant monitoring the ERA is able to develop evidence-based knowledge which can be disseminated to help guide similar reconstruction efforts in other parts of China and the rest of the world.

### Conclusion

The pace of China’s recent urbanization has largely precluded development practices that incorporate ecological concerns. However, along with the maturation of the landscape architecture profession in China, this is now changing. Environmental awareness is growing and the connections between landscape ecology and human health in relation to the design and construction of urban form are increasingly appreciated. The concepts and related policies of ecological civilization and Beautiful China manifest this awareness and make it not only possible, but probable that China will be able to undertake a coordinated national project of restoring the health and vitality of its ancient landscape as the 21st century unfolds. This proposal by the students and faculty of the University of Pennsylvania Weitzman School of Design offers a sketch of how such a process might be initiated and managed in the case of the Jing-Jin-Ji megaregion.

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