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**Valle Maggia: Institutional  
Regime of Water**

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Comparative analysis of the formation and the outcomes of the  
institutional resource regimes in Switzerland

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Vergleichende Analyse der Genese und Auswirkungen institu-  
tioneller Ressourcenregime in der Schweiz

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Analyse comparée de la genèse et des effets des régimes insti-  
tutionnels de ressources naturelles en Suisse

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## ***Analyse comparée de la formation et des effets des régimes institutionnels de ressources naturelles en Suisse***

Partant du constat de l'accroissement significatif et généralisé de la consommation des ressources naturelles, le projet a pour ambition d'examiner, dans le cas de la Suisse, quels sont les types de régimes institutionnels -régimes composés de l'ensemble des droits de propriété de disposition et d'usages s'appliquant aux différentes ressources naturelles, de même que des politiques publiques d'exploitation et de protection les régulant- susceptibles de prévenir des processus de surexploitation et de dégradation de ces ressources.

Dans le cadre de ce projet de recherche financé par le Fonds national suisse de la recherche scientifique (FNRS), il s'agit, dans un premier temps, d'analyser les trajectoires historiques d'adaptation et de changements des régimes institutionnels des différentes ressources sur une durée d'environ un siècle (1900-2000). C'est l'objet des différents screenings.

Dans un second temps et à l'aide d'études de cas, ces transformations de (ou au sein des) régimes institutionnels sont analysées sous l'angle de leurs effets sur l'état de la ressource.

L'ambition finale de cette recherche est de comprendre les conditions d'émergence de "régimes intégrés" capables de prendre en compte un nombre croissant de groupes d'utilisateurs agissant à différents niveaux (géographiques et institutionnels) et ayant des usages de plus en plus hétérogènes et concurrents de ces différentes ressources.

Le champ empirique de la recherche porte plus particulièrement sur cinq ressources que sont: l'eau, l'air, le sol, le paysage et la forêt.

## ***Vergleichende Analyse der Genese und Auswirkungen institutioneller Ressourcenregime in der Schweiz***

Ausgehend von der Feststellung, dass die Konsumraten natürlicher Ressourcen weltweit stetig steigen, untersucht das Projekt, ob und welche institutionellen Regime in der Schweiz einer Übernutzung und Degradation von solchen Ressourcen entgegenwirken. Solche Regime bestehen aus der eigentumsrechtlichen Grundordnung (Eigentumstitel, Verfügungs- und Nutzungsrechte) und der Gesamtheit der ressourcenspezifischen öffentlichen Nutzungs- und Schutzpolitiken.

In einem ersten Schritt zeichnen wir nach, wie sich die institutionellen Regime verschiedener Ressourcen über eine Dauer von ungefähr hundert Jahren (1900-2000) angepasst und entwickelt haben. Diese überblicksartigen historischen Analysen bilden den Inhalt der verschiedenen Screenings.

In einem zweiten Schritt werden mittels Fallstudien die Wirkungen von Veränderungen eines institutionellen Regimes auf den Zustand der Ressource evaluiert.

Mit dem Projekt soll das Verständnis dafür erhöht werden, unter welchen Bedingungen „integrierte Regime“ entstehen können: Wie kann es zu institutionellen Regimen kommen, welche die zunehmend heterogenen und konkurrenzierenden Nutzungen einer steigenden Anzahl von Nutzergruppen aus verschiedenen geographischen und institutionellen Ebenen berücksichtigen?

Als empirische Beispiele stehen in diesem vom Schweizerischen Nationalfonds zur Förderung der wissenschaftlichen Forschung (SNF) finanzierten Projekt die fünf natürlichen Ressourcen Wasser, Luft, Boden, Landschaft und Wald im Zentrum.

## ***Comparative analysis of the formation and outcomes of resource regimes in Switzerland***

In the context of a significant and widespread increase in the consumption of natural resources, the aim of this project is to determine, in the case of Switzerland, which type of institutional regime (the property and uses rights pertaining to the different natural resources as well as the public policies regulating their exploitation and protection) would most effectively prevent the overexploitation and degradation of these resources.

In the first stage of this project, financed by the Swiss National Science Foundation, we will analyse how previous institutional regimes evolved over a period of one hundred years (1900-2000). Several screenings will be devoted to this issue.

The next stage of our research will be devoted to the analysis, based on several case studies, of these modifications from the point of view of their impact on the state of a given natural resource.

The final aim of this research project is to understand the conditions necessary for the elaboration of an "integrated regime" which would take into account the growing number of users at various levels (both geographical and institutional), as well as the increasingly varied and competing forms of consumption of these resources.

This study will focus on five main resources: water, air, soil, landscape and forests.

## **EINLEITUNG\***

Im Rahmen der dritten Phase der eingangs vorgestellten Studie "Vergleichende Analyse der Genese und Auswirkungen institutioneller Ressourcenregime" wurden im achtköpfigen Forschungsteam<sup>1</sup> insgesamt zehn Fallstudien zu Veränderungen regionaler Ressourcenregime in den Bereichen Wasser, Boden und Wald erstellt (zwischen August 2000 und März 2002)<sup>2</sup>. Sie bilden die Grundlage für die zweite Projektpublikation zu institutionellen Regimen natürlicher Ressourcen, die im Rahmen eines Nationalfonds-Projektes (Nr. 1214-55890-98/1, September 1999 bis August 2002) entstand<sup>3</sup>. Die Fallstudien sollten Antwort geben auf die drei folgenden Forschungsfragen.

### **Gemeinsame Forschungsfragen**

1. *Wie entstehen bzw. verändern sich* institutionelle Regime natürlicher Ressourcen in Raum und Zeit und welches ist der Auslöser solcher Veränderungen *auf lokaler bzw. regionaler Ebene*? Unter welchen Bedingungen sind welche ihrer konstitutiven Elemente (z.B. Nutzungsrechte, Zielgruppen, Politikinstrumente) am stärksten von solchen Veränderungen betroffen? Welchen Anteil haben Veränderungen der eigentumsrechtlichen Grundordnung und Veränderungen öffentlicher Schutz- und Nutzungspolitiken an der Lösung welcher typischer Ressourcenprobleme?

Die empirischen Fallstudien sollten Hinweise darauf geben, wie sich Veränderungen der eigentumsrechtlichen Grundordnung und der öffentlichen Schutz- und Nutzungspolitiken auf die beiden nach dem IR-Konzept massgeblichen Regimedimensionen "Ausmass" und "Kohärenz" und auf die effektive Ressourcenutzung und derer Nachhaltigkeit auswirken.

2. Welchen Erklärungsgehalt haben die in den historischen Screenings analysierten (letztmaligen) Veränderungen der *nationalen Determinanten* institutioneller Ressourcenregime für die beobachtbaren Veränderungen auf lokaler Ebene? Gibt es spezifische kantonale und regionale Regimedynamiken, die sich nicht durch Entwicklungen der nationalen IR-Determinanten erklären lassen?

Diese Frage liegt auf der Linie der klassischen Vollzugsforschung, die aufgezeigt hat, dass nicht zu erwarten ist, dass nationale Politikänderungen auf lokaler Ebene gewissermassen mechanisch "vollzogen" würden. Denkbar sind vielmehr auch Situationen, in denen regionale Bewegungen solchen auf nationaler Ebene vorgehen oder völlig anders verlaufen, als es die nationalen Politikvorgaben verlangen. Denkbar ist ausserdem, dass die in der klassischen Politikanalyse weitgehend unberücksichtigten Eigentumsstrukturen wichtige Veränderungen erfahren haben, die keine explizite Grundlage in den nationalen Determinanten der IR haben.

3. Wie wirken sich Regimeveränderungen auf das Verhalten der *Ressourcennutzer* und auf den *Ressourcenzustand* aus?

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\* Teilweise Textauschnitte aus den Kapiteln 1 und 2 des zweiten Buches (Knoepfel et al. 2003).

<sup>1</sup> Peter Knoepfel, Ingrid Kissling-Näf, Frédéric Varone, Kurt Bisang, Corine Mauch, Stéphane Nahrath, Emmanuel Reynard, Adèle Thorens.

<sup>2</sup> Das sind je drei Studien zum Boden und zum Wald sowie vier zum Wasser (von den Wasserstudien sind zwei auch Bestandteile der international vergleichenden EU-Studie Euawareness ([www.Euawareness.nl](http://www.Euawareness.nl)) abgeschlossen Ende Februar 2002).

<sup>3</sup> Vgl. zur Publikationsliste: [www.idheap.ch](http://www.idheap.ch) (UER politiques publiques/environnement-publications IRM).

Im Besonderen fragen wir, inwiefern eine Ausweitung der Zahl der explizit regulierten Güter und Dienstleistungen bezogen auf die Gesamtheit der tatsächlichen Ressourcennutzungen (Erweiterung des absoluten und relativen Ausmasses) nachhaltigere Nutzungspraktiken bewirkt. Inwiefern wird nachhaltiger genutzt, nachdem die interne und/oder die externe Kohärenz angestiegen sind?

Welche *Wirkungen* haben Regimeveränderungen für den *Ressourcenbestand*? Dies ist die zentrale Frage unseres Vorhabens. Wir hatten bereits in unserem Forschungsantrag von 1998 postuliert, dass "umfassende Ressourcensteuerung ... nur möglich (wird), wenn es gelingt, integrierte institutionelle Ressourcenregime einzuführen."

## Das Konzept der institutionellen Regime (IR)

Institutionelle Regime bestehen gemäss dem IR-Ansatz zum einen aus der eigentumsrechtlichen Grundordnung (= regulatives System), die bestimmte Verfügungs- oder Nutzungsrechte am Stock, an den Erträgen oder an (einzelnen) Gütern und Dienstleistungen umschreibt und diese berechtigten Einzelpersonen, Personengruppen oder öffentlichen Körperschaften zuweist oder als dem Privateigentum nicht zugängliche Gemeinschaftsgüter (res nullius) definiert. Hinzu kommen als zweite definitorische Komponente ressourcen- oder aktivitätsspezifische öffentliche Schutz- oder Nutzungspolitiken, die den durch die Eigentumsordnung konstituierten Rechtssubjekten oder von diesen Politiken selbst neu definierten Zielgruppen bestimmte Nutzungsrechte, Schutzpflichten oder Nutzungsbeschränkungen zuteilen oder auferlegen. Diese bezwecken die Reproduktionsfähigkeit des Ressourcenstockes zu erhalten, den Ertrag dieser Reproduktion für eine bestimmte (meist wirtschaftliche) Aktivität zu sichern und/oder die Gesamtmenge der entnommenen Güter und Dienstleistungen nach Massgabe bestimmter politischer Zielsetzungen zu begrenzen oder in anderer Weise zu verteilen (Knoepfel et al. 2001: 35 ff.).

## Institutionelle Regime natürlicher Ressourcen (IR-Konzept) in der Praxis

In der Praxis lassen sich institutionelle Regime natürlicher Ressourcen zusammenfassend durch folgende vier Merkmale charakterisieren:

- "• *Regionaler Perimeter*. Dieser wird durch physische Flüsse von Gütern und Dienstleistungen zwischen Stock und aneignenden, produzierenden oder endnutzenden Akteuren geographisch determiniert. Im Zentrum findet die Entnahme der wichtigsten Güter und Dienstleistungen statt; an deren Peripherie finden sich die Ressourcennutzer<sup>4</sup>. Dieser Perimeter bildet damit in der Regel den Lebens- und Wirkungsraum der hauptsächlichsten Ressourcennutzer. Allerdings wird diese geographische Determinante in vielen Fällen durch eine gesellschaftliche oder politische Konstruktion relativiert, modifiziert oder gar ersetzt. So finden sich im Zeitalter einer quasi totalen Überbauung im schweizerischen Mittelland vielfach keine soziogeographischen Gründe für Gemeinde-, Regions- oder Kantonsgrenzen (Ressource Boden). Ähnliches gilt für geomorphologisch nicht begründete, lediglich durch ändernde Namensgebungen ersichtliche Wald- oder Gewässerperimeter.

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<sup>4</sup> Produzenten und mitunter auch die Endnutzer.

- Der Bestand expliziter, für die ganze Ressource gültiger (und damit regional wirksamer) *Regulierungen* für einzelne oder alle *Güter und Dienstleistungen* einer Ressource, für die lokal *Nutzungs rivalitäten* auftreten können<sup>5</sup>. Solche Rivalitäten und entsprechende Regulierungen sind allerdings für den Bestand der Gesamtressource nur dann von Bedeutung, wenn deren Lösung eine Modifikation anderer Nutzungen derselben Ressource im gleichen Perimeter erfordert. Von einer solchen Rivalität kann bei örtlich vollständig isolierbaren Nutzungskonflikten nicht gesprochen werden, weil sie für die Erneuerbarkeit der Gesamtressource bedeutungslos sind. Das ist etwa der Fall bei sporadisch wiederkehrenden örtlich begrenzten Wassernutzungskonflikten in Gebieten, die grossflächig über Wasser im Überfluss verfügen<sup>6</sup>. Umgekehrt lassen sich echte Rivalitäten in der Praxis nicht dadurch lösen, dass die Regulierungen den Perimeter der Ressource ad libitum ausdehnen. Denn Perimeterverschiebungen schaffen oft neue Rivalitäten rund um neu angezapfte (andere) Ressourcen.

Wie ausgeführt, ist der Bestand akuter Rivalitäten kein Garant für die empirische Existenz eines Regimes. Dies gilt selbst dann, wenn die nationale Gesetzgebung den Aufbau eines solchen Regimes fordert. Umgekehrt kann der Nichtbestand von konfliktreichen Rivalitäten auch auf das befriedigende Funktionieren eines tatsächlich bestehenden Regimes hinweisen.

- Der Bestand empirisch beobachtbarer *Umsetzungsaktivitäten* politisch-administrativer Akteure von Programmen öffentlicher Schutz- und Nutzungspolitiken gegenüber identifizierten Zielgruppen. Diese treten meist in Gestalt von Aktionsplänen und konkreten Policy-Outputs (Bewilligungen, Konzessionen, Nutzungsbeschränkungen) auf, die sich auf ein und dieselbe Ressource beziehen. Solche Politikumsetzungsaktivitäten sind bestrebt, nach Massgabe einer bestimmten Schutz- oder Nutzungszielsetzung Verhaltensänderungen durchzusetzen. Dabei definieren sie oft auch *Eigentums-, Verfügungs- oder Nutzungsrechte* der nach der eigentumsrechtlichen Grundordnung berechtigten Akteure an den regulierten Gütern und Dienstleistungen inhaltlich und/oder mengenmässig neu. Dies geschieht dadurch, dass die zuständigen behördlichen Akteure im Ressourcenperimeter punktuell oder flächendeckend
  - selbst Eigentumstitel erwerben, um von den betroffenen Gütern und Dienstleistungen einen anderen Gebrauch zu machen oder diese anderen Akteuren zuzuführen (Ankauf oder formelle Expropriation);
  - Verfügungs- und Nutzungsrechte qualitativ oder quantitativ im Interesse der Zielsetzungen der öffentlichen Schutz- und Nutzungspolitiken modifizieren (materielle Entzweiung mit Entschädigungsfolgen infolge bedeutsamen Beschränkungen der Handlungsspielräume der vorhandenen Nutzer; Beispiel: Rückzonung baureifen Landes);
  - solche Rechte im Interessen der öffentlichen Schutz- und Nutzungspolitiken marginal beschränken, ohne dabei entschädigungspflichtig zu werden. (Beispiel: Zonenplanrevision);
  - Eigentums-, Verfügungs- oder Nutzungsrechte im Interesse konfliktfreierer Beziehungen unter den Berechtigten mit den Mitteln des Privatrechts präziser definieren (ohne dadurch notwendigerweise die Handlungsspielräume der berechtigten Nutzer wesent-

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<sup>5</sup> Das können sowohl tatsächlich angewandte eidgenössische, als auch kantonale oder (inter)kommunale Regulierungen sein.

<sup>6</sup> Vgl. dazu unten: Subcases, Abschnitt 4.

lich einzuschränken; Beispiel: Festlegung von Grenzabständen in den kantonalen Einführungsgesetzen zum Zivilgesetzrecht).

Der damit angestrebte Abbau von Konflikten, die auf Rivalitäten zurückgehen, erfolgt entweder durch Klärungen bzw. Modifizierungen der Rechte in der eigentumsrechtlichen Grundordnung ("regulatives System") und/oder durch eine parallel dazu erfolgende neue Regulierung für bestimmte Güter und Dienstleistungen im Rahmen öffentlicher Politiken. Bezweckt wird die Lösung von Nutzerproblemen anderer Akteure. Auf diese Weise präsentiert sich die dem IR-Ansatz zugrunde gelegte Formel, wonach sich Regime aus den beiden interagierenden Komponenten "Policy-Design" und "regulatives System" (= eigentumsrechtliche Grundordnung) zusammensetzen, im konkreten Feld sehr anschaulich.

- Das Vorhandensein identifizierbarer *Akteurgemeinschaften* rund um die relevanten (rivalisierenden oder ehemals rivalisierenden) Güter und Dienstleistungen. Darin finden sich mindestens die zwei Koalitionen der Nutzungsberechtigten und der Nicht-Nutzungsberechtigten." (Knoepfel et al. 2003).

Bereits für das Screening der IR-Ressourcen Boden, Wasser, Wald, Luft und Landschaft im ersten Projektteil (Knoepfel et al. 2001) und die dort identifizierten letzten grossen Veränderungen der nationalen Regimedeterminanten verwenden wir folgende vier Regimetypen:

- *Kein Regime*: Es fehlen für Stock, jährliche Ernte und für die meisten der heute denkbaren Güter und Dienstleistungen eigentumsrechtliche Bestimmungen und jedwelche öffentlichen Politiken.
- *Einfaches Regime*: Für Stock, Ernte und einige (wenige) der heute denkbaren Güter und Dienstleistungen besteht ein und dieselbe eigentumsrechtliche Grundordnung; öffentliche Politiken fehlen weitgehend. Als einfaches Regime gilt auch die Situation, in der nur eine oder ganz wenige der Güter und Dienstleistungen eigentumsrechtlich und/oder durch eine öffentliche Politik reguliert werden.
- *Komplexes Regime*: Für ein und dieselbe Ressource besteht ein relativ differenziertes regulatives System (unterschiedliche Eigentumstitel, Verfügungs- und Nutzungsrechte für den Stock oder für die Güter und Dienstleistungen bzw. nur für diese letzteren) und/oder diese Letzteren werden (z.B. je Aktivitätsbereich) von einer Vielzahl öffentlicher Sektorpolitiken reguliert, die insbesondere auf der Ebene der einschlägigen Policy-Designs oder der dazugehörigen (mehr oder weniger zentralisierten) institutionellen Akteurarrangements weitgehend unkoordiniert nebeneinander existieren.
- *Integriertes Regime*: Solche nach der zentralen Projekthypothese für die Nachhaltigkeit ideale Regime zeichnen sich durch ein ausgeprägtes Ausmass der abgedeckten Güter und Dienstleistungen, durch ein kohärentes regulatives System, durch starke Interpolicy-Koordination auf der Ebene der öffentlichen Politiken und durch hohe Kompatibilität von Policy-Designs und regulativem System aus. Diese hohe Kohärenz wird wesentlich mitbestimmt durch eine intensive Koordination der beteiligten Akteure.

Diese vier Regimetypen lassen sich nach Massgabe ihres variierenden Ausmasses (Anzahl der einbezogenen Güter und Dienstleistungen und Modalität ihrer Verknüpfung) und ihrer Kohärenz (Koordination unter den Akteuren durch Regeln im Policy-Design, im regulativen System und zur wechselseitigen Beziehung zwischen diesen beiden Regimekomponenten) im Rahmen einer Vierfeldermatrix wiedergeben (Abb.1).

## Abbildung 1: IR - Typen

		<i>Kohärenz</i> (Akteurkoordination)	
		tief	hoch
<i>Ausmass</i> ("étendue", "extent") der einbezogenen Güter und Dienstleistungen	klein	Kein Regime	Einfaches Regime
	gross	Komplexes Regime	Integriertes Regime

Die für die Analyse des regulativen Systems und des Policy-Designs gleichermaßen verwendete Dimension des *Ausmasses* der Regime ("Anzahl der einbezogenen Güter und Dienstleistungen") hat sich als robust erwiesen. Im Hinblick auf eine genaue Bestimmung der *Kohärenz* der Regime mussten demgegenüber die *Akteure stärker gewichtet* werden. Denn entgegen unserer ursprünglichen Annahme ist ein institutionelles Regime nicht schon dann als kohärent zu betrachten, wenn sein Policy-Design aufgrund seiner Kausal- und Interventionshypothesen in sich stimmig ist. Kohärenz verlangt ausserdem, dass die darin identifizierten Zielgruppen mit den im regulativen System ausgewiesenen nutzungs- bzw. verfügungsberechtigten Rechtssubjekten (auf den Ebenen der Eigentümer, der Nutzungsberechtigten und der Endnutzer) übereinstimmen oder im Falle ihrer Nichtidentität durch wirksame Mechanismen zwingend miteinander koordiniert werden. Diese Bedingung erfüllen einfache und integrierte Regime, die sich allerdings bezüglich ihres Ausmasses deutlich unterscheiden.

"Keine Regime" und "komplexe Regime" unterscheiden sich ebenfalls bezüglich des Ausmasses der einbezogenen Güter und Dienstleistungen. Sie gleichen sich indessen bezüglich ihrer mangelnden Kohärenz. Dadurch unterscheiden sie sich beide von integrierten Regimen. Denn bei ihnen stellen weder die eigentumsrechtliche Grundordnung (in der heutigen Schweiz vornehmlich das Zivilrecht; im Mittelalter: das System der *plura dominia*), noch die Policy-Designs (etwa auf der Ebene der (zielgruppenspezifischen) Interventionsinstrumente oder ihrer administrativen Arrangements) hinlängliche Mechanismen für eine zwingende Koordination unter den Akteuren sicher. Die Konsequenz daraus sind abgeschottete Akteurarenen und sich widersprechende Aktionspläne bzw. Politikoutputs (etwa der Wassernutzungs- und der Wasserschutzpolitik).

Das auf den vorgetragenen Fallstudien basierende zweite Buch (Knoepfel et al. 2003) enthält eine konzeptionelle Weiterentwicklung dieses hier vorgetragenen IR-Ansatzes, auf die hier verwiesen sei. Danach unterscheiden wir innerhalb der vier Regimekategorien im Sinne der Veränderungsdynamik der Regime stabile und instabile Regime. Diese Unterscheidung geht darauf zurück, dass die (interne oder – vor allem – externe) Kohärenz durch entsprechende substantielle (inhaltliche Umschreibung der Nutzungsrechte oder der Politikziele) und/oder institutionelle (Koordinationspflichten etc.) Regelungen abgesichert ist oder nicht. Instabile Regime lassen den Akteuren grosse Spielräume und sind daher veränderungsanfälliger als stabile. Daraus resultiert folgende (in den meisten Fallstudien angewandte) Typologie:

**Tabelle 1 Verfeinerte Qualifizierung der Regimetypen**

	Niedrige Kohärenz				Hohe Kohärenz			
	<i>Niedrige interne Kohärenz im RS</i> (selten in CH)	<i>Niedrige interne Kohärenz im PD</i> (häufig in CH)	<i>Niedrige externe Kohärenz des IR</i>  = <i>stabile externe Inkohärenz</i>	<b>Hohe externe Kohärenz</b> trotz niedriger interner Kohärenz im PD*  = <i>instabile externe Kohärenz</i>	<i>Hohe interne Kohärenz im RS</i>	<i>Hohe interne Kohärenz im PD</i>	<i>Hohe externe Kohärenz des IR</i>  = <i>stabile externe Kohärenz</i>	<b>Niedrige externe Kohärenz</b> trotz hoher Kohärenz im PD und im RS  = <i>instabile externe Inkohärenz</i>
<b>KLEINES RELATIVES AUSMASS</b> Vor und nach dem Change bestehen bedeutsame Regulierungslücken (Zahl der explizit regulierten Güter und Dienstleistungen ist kleiner als jene der (potentiell) rivalisierenden Güter und Dienstleistungen)			Stabiles no – regime	Instabiles no-Regime			Stabiles einfaches Regime	Instabiles einfaches Regime
<b>GROSSES RELATIVES AUSMASS</b> Alle relevanten (potentiell) rivalisierenden Güter und Dienstleistungen einer (regionalen) Ressource werden durch explizite Regulierungen (regulatives System und/oder öffentliche Politiken) abgedeckt (relative Ausdehnung = 1)			Stabiles komplexes Regime	Instabiles komplexes Regime			Stabiles integriertes Regime	Instabiles integriertes Regime

\* Die Variante eines inkohärenten RS beim Wasser ist denkbar, kommt indessen in den zwei Ressourcen Boden und Wald in der Schweiz kaum vor.

## Auswahl der Fallstudien

Die Auswahl der regionalen Ressourcen, die Gegenstand der Fallstudien sind, erfolgte aufgrund von allgemeinen und ressourcenspezifischen Kriterien. Für alle Fallstudien kamen folgende Kriterien zur Anwendung:

- Die Nutzungssituation ist durch starke Nutzungsrivalitäten gekennzeichnet, die sich auch an Konflikten zwischen verschiedenen Ressourcennutzern äussern können.
- Die fokussierten Nutzungsrivalitäten waren Gegenstand der (in den Screenings ausgewiesenen) Revision/Anpassung der nationalen Regimedeterminanten.
- Die Eigentumsverhältnisse variieren (ortzeitlich) bzw. die Ressourcen weisen unterschiedliche Eigentümer (im speziellen öffentliches und privates Eigentum) auf.
- Die Perimeter der Ressourcensysteme sind bezüglich Grösse und Komplexität vergleichbar.
- Die forschungsökonomische Machbarkeit der Fallstudie inkl. Zugang zur Dokumentation wie auch die Möglichkeit, die Auswirkungen der Regimeveränderungen über einen längeren Zeitraum zu beobachten, sind gegeben

Ressourcenspezifisch und damit stärker situativ mussten folgende Kriterien berücksichtigt werden:

- Es handelt sich um für die Ressource repräsentative Nutzungskonflikte.
- Es werden die Auswirkungen der Veränderungen der nationalen Komponenten der Ressourcenregime untersucht, die für die regimespezifischen Veränderungen charakteristisch sind.

Aufgrund dieser Kriterien wurden folgende Fallstudien ausgewählt (Abbildung 2).

**Abbildung 2: Ausgewählte Fallstudien über lokale institutionellen Regime für die Ressourcen Boden, Wasser und Wald**

Gebietsbezeichnung (inkl. Kanton)	Fläche / Einzugsgebiet	Untersuchte Güter und Dienstleistungen	Untersuchungsperiode
<i>Ressource Boden</i>			
1. Bielersee (BE)	Seeufer	1. Schifflandeplätze 2. Zweit(Ferien)wohnungen 3. Infrastrukturnutzung (SBB, NS5) 4. Seeufer-Wanderweg	1930 (65) - 1985
2. Rückzonung Hueb (BE)	Periurbane Landschaft	1. Wohnnutzung und Fruchtfolgeflächen	1960 - 1990
3. Agglomeration Lausanne (VD)	Agglomeration und ihr Hinterland	1. Wohnnutzung versus Grünflächen 2. Wohnnutzung versus Rebflächen 3. Wohnnutzung versus landwirtschaftliche Nutzung	1960 - 1985
<i>Ressource Wasser</i>			
4. Val de Bagnes (VS)	300 km <sup>2</sup>	1. Elektrizitätsnutzung und Restwassermengen 2. Trinkwassernutzung 3. Abfallsenke (ARA's)	1975 - 2001
5. Unterlauf Thur (ZH)	120 km <sup>2</sup>	1. Hochwasser- und Auenschutz 2. Restwassermengen und Entwässerung 3. Elektrizitätsproduktion	1975-2001
6. Seetal ( Baldegger- und Hallwilersee) (AG, LU)	138 km <sup>2</sup>	1. Senke für Haushalte, Industrie und Gewerbe 2. Senke für die Landwirtschaft 3. Seeuferschutz	1975-2001
7. Valle Maggia (TI)	600 km <sup>2</sup>	1. Elektrizitätsgewinnung und Restwassermengen 2. Industrienutzung (Kies, Gneiss) versus Auenschutz 3. Hochwasser- und Auenschutz	1975-2001

Gebietsbezeichnung (inkl. Kanton)	Fläche / Einzugsgebiet	Untersuchte Güter und Dienstleistungen	Untersuchungsperiode
<i>Ressource Wald</i>			
Melioration Wildberg (ZH)	1200 ha	1. Ausbau von Erschliessungstrassen (Holznutzung, Erholung, Biodiversität) 2. Abstand von Feldstrassen zum Wald (Landwirtschaft, Biodiversität)	1985-2002
Pfywald (VS)	1600 ha	1. Verkehrsinfrastruktur und Naturschutz 2. Verkehrsinfrastruktur und Erholung und Tourismus 3. Erholung und Tourismus und Naturschutz	1980-2002
Gurtenwald (BE)	200 ha	1. Holznutzung versus Naturschutz 2. Naturschutz versus Erholung	1985-2002

## Zum Forschungsvorgehen

Das Forschungsprotokoll, das für die Durchführung jeder Fallstudie zur Anwendung kam, umfasst Vorgaben zu den Forschungsschritten und zu untersuchenden Dimensionen, zu den dabei zu berücksichtigenden Prinzipien wie auch zum Inhaltsverzeichnis der Fallstudien.

Prinzipiellen Charakter für die Forschungsstrategie hatten folgende Überlegungen:

- *Güter- und dienstleistungsorientierter Ansatz*: Für die gewählten Ressourcen sollten im lokalen/regionalen Raum die genutzten Güter und Dienstleistungen sowie die Nutzergruppen identifiziert und analysiert werden.
- *Diachrone Betrachtung*: Zur Überprüfung der Wirkungen von Änderungen der nationalen Regimedeterminanten wurden mindestens zwei Zeitpunkte miteinander verglichen. Der diachrone Vergleich erfordert Aussagen zum Regimetyyp, zu den Rivalitäten, zur tatsächlichen Nutzung und zur Bewertung der Nutzung für den Erhalt der Ressource *vor und nach dem in den Screenings identifizierten (letzten) Regimechange*. Gefragt wurde demzufolge nach den institutionellen Anreizen für die identifizierten Akteurguppen, die zu den unterschiedlichen Zeitpunkten deren Verhalten bestimmt haben.
- *Bottum-up-Approach*: Ausgangspunkt der Erhebungen sind nicht rechtliche Vorgaben, sondern die tatsächlich im Ressourcenperimeter beobachteten Nutzungen. Die Gegenüberstellung mit den nationalen Änderungen erlaubt Aussagen darüber, inwieweit die neu festgesetzten institutionellen Anreize überhaupt in den lokalen Raum „übersetzt“ worden sind.
- *Prozessanalyse*: Um mögliche Veränderungen über die Zeit verstehen zu können, wurden soweit möglich Prozessanalysen vorgenommen.

## Zur Figur der "Subcases"

Die interessierenden Nutzungsrivalitäten und die darauf bezogenen Entscheidungsprozesse beziehen sich kaum je auf den gesamten Perimeter der Ressource. Sie betreffen vielmehr spezifische Teilräume.

In diesen Räumen finden die politisch-administrativen Entscheidungsprozesse ihren Ausgangspunkt. Auch wenn als gemeinsames Referenzsystem der Akteure nicht nur dieser Teilraum, sondern der gesamte regionale Ressourcenperimeter präsent bleibt und sich unter den Akteuren deshalb auch Vertreter überörtlicher Gruppen aus der Nachbarschaft befinden, ist der sozio-geographisch determinierte regionale Perimeter aus politikwissenschaftlicher Sicht ein analytisches Konstrukt. In keinem der untersuchten schweizerischen Ressourcenperimeter gibt es so etwas wie (regionale) öffentlich-rechtliche Ressourcenkörperschaften, in denen gleichzeitig Stock, Erntemengen und sämtliche entnommenen Güter und Dienstleistungen koordiniert reguliert und auftretende Rivalitäten politisch entschieden würden.

Aus diesem Grunde haben wir uns in Abstimmung mit dem internationalen Projekt Eawareness<sup>1</sup> dazu entschieden, die empirischen Studien auf sog. *Subcases* zu konzentrieren. Subcases sind geographisch definierte Orte, an denen einzelne Güter oder Dienstleistungen der in den Fallstudien fokussierten regionalen Ressourcen in besonderer Weise genutzt werden (Über- oder Unternutzung) und dadurch die Nutzung anderer, rivalisierender Güter und Dienstleistungen derselben Ressource ernsthaft bedrohen. Solche Nutzungssituationen gefährden daher die Erneuerbarkeit der gesamten regionalen Ressource (sofern anderswo die bisherigen Nutzungen der betroffenen Güter und Dienstleistungen beibehalten werden). Solche Subcases beziehen sich damit auf Orte, an denen bestimmte, auch anderswo im Perimeter genutzte Güter und Dienstleistungen besonders intensiv oder extensiv genutzt werden, sofern dadurch die Nutzung anderer (vielfach ökologischer) Dienstleistungen in der bisherigen oder in einer politisch gewollt zu verändernder Weise in Frage gestellt wird.

Ein Subcase stellt damit immer einen Entscheidungsprozess dar, der sich auf zwei prinzipiell unterschiedliche geographische Ort bezieht, nämlich auf den Ort der besonders problematischen Nutzung eines Gutes und den oder die Orte der dadurch ausgelösten Veränderungen und ihrer Auswirkungen auf dieselbe Ressource. Dementsprechend sind in den analysierten Entscheidungsprozessen der Subcases immer mindestens zwei bestimmte Güter und Dienstleistungen in Anspruch nehmende lokale Akteurguppen präsent. In den meisten untersuchten Fällen treten in diesen Prozessen aber auch regionale Akteure auf, die zwischen diesen beiden Interessengruppen zu vermitteln suchen und auf diese Weise die Interessen eines konfliktfreien Weiterbestands der bisherigen Nutzung der betroffenen Güter und Dienstleistungen ausserhalb der besonders betroffenen Orte vertreten.

Mit der forschungsstrategischen Fokalisierung auf solche Subcases geht die Annahme einher, dass sich die Entwicklungsdynamik des institutionellen Ressourcenregimes, die wir mittels der Dimension Ausmass und Kohärenz messen, in der Fähigkeit dieser an verschiedenen Rivalitätsfronten operierenden Akteure ausdrückt, die Rechte der konkurrierenden Nutzerinnen und Nutzer verbindlich aufeinander abzustimmen. Dies geschieht über den Einsatz neuer oder bestehender öffentlicher Politiken (des Bundes oder der Kantone) und damit einhergehender oder davon mehr oder weniger unabhängiger Umverteilungen der Nutzungsrechte innerhalb oder zwischen den Güter- und Dienstleistungskategorien. Dadurch soll die Erneuerbarkeit der

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<sup>1</sup> Cf. Bressers, Kuks 2002.

regionalen Ressource erhalten bleiben. Die physischen Prozesse der Selbsterneuerung dieser Ressource müssen dabei nicht an den gleichen Orten stattfinden, wie die Nutzung ihrer Güter und Dienstleistungen.

## **Zu den Nachhaltigkeitsindikatoren**

Bereits zum Zeitpunkt der Antragstellung war uns bewusst, dass auch bezüglich den verwendeten *Nachhaltigkeitsindikatoren* Vorsicht geboten sein würde. Es kann nicht Aufgabe eines sozialwissenschaftlichen Forschungsvorhabens sein, im Feld selbst Daten zu einschlägigen Nachhaltigkeitsindikatoren zu erheben. Wir haben uns deshalb bei der Beurteilung der Nachhaltigkeitswirkungen der untersuchten regionalen Regimeveränderungen mit der Dokumentation verfügbarer Daten begnügt. Die Indikatoren selbst stammen aus den mittlerweile recht detaillierten Indikatorenlisten, die heute in Politik, Verwaltung oder Wissenschaft zur Anwendung gelangen. Für jede Ressource wurden daraus je drei Indikatoren zur ökologischen, wirtschaftlichen und sozialen Nachhaltigkeit ausgewählt, für die wir im Feld Daten für die Situation vor und nach dem Regimechange fanden.

Vorsichtshalber haben wir in den Fallstudien auf evaluative Gesamtstatements verzichtet. Es gibt heute und vermutlich auch in naher Zukunft keine verlässlichen Methoden, die es erlauben, Befunde zu diesen drei Indikatorenfamilien gegeneinander abzugleichen. Dasselbe gilt vermutlich bereits innerhalb einer jeden dieser Indikatorengruppen. Deshalb haben wir uns damit begnügt, feststellbare Veränderungen entlang dieser Indikatoren zu dokumentieren und auf dieser Grundlage annäherungsweise Aussagen zu Trends, nicht aber zum (absoluten) Stand der nachhaltigen Nutzung der verschiedenen Ressourcen zu formulieren.

## **Gemeinsame Struktur der Fallstudien**

Die zehn Fallstudien weisen dieselbe Grundstruktur auf, die das Forschungsteam zu Beginn der Redaktionsarbeiten im Interesse einer vergleichenden Lesbarkeit festgelegt hat. Diese präsentiert sich folgendermassen:

1. *Einleitung*: Begründung der Fallstudienauswahl, Begründung und Umschreibung des gewählten Perimeters.
2. *Der Perimeter und die Subcases*: Geographische, morphologische und soziopolitische Beschreibung des Perimeters; tabellarische Auflistung der betroffenen Güter und Dienstleistungen der Ressource; Auswahl der analysierten Nutzungsrivalitäten (Subcases).
3. *Nachhaltigkeitskriterien*: Präsentation der verwendeten (quantitativen und teilweise auch qualitativen) Messgrößen für die Auswirkungen des Regimewandels.
4. *Allgemeine Chronologie*: Ereignisse und Entscheidungsprozesse auf der Ebene des Gesamtperimeters und der Subcases.
5. *Situation vor dem analysierten Regimechange*: Situation des Regimes; eigentumsrechtliche Grundordnung und wirksame öffentliche Schutz- und Nutzungspolitiken und daraus resultierende Nutzungssituationen; Situation auf der Ebene der zwei bis vier Subcases sowie Evaluation der Kohärenz und des Ausmasses des vorbestandenen Regimes.
6. *Vergleich der Situation vor und nach dem Regimechange*: Darstellung der Beobachtungen zu den sich verändernden Regimedimensionen (eigentumsrechtliche Grundordnung und Policy-Design); Entwicklung der Ressourcennutzungen während und nach der Regimeveränderung (auf der Ebene der Gesamtressource sowie innerhalb der Subcases); Verän-

derungen der Kohärenz und des Ausmasses; Nebenfolgen des Regimechanges (Auftreten allfälliger neuer Rivalitäten).

7. *Erklärungsfaktoren für den Regimechange*: Veränderungsdynamiken.
8. *Auswirkungen des Regimechange*: Veränderungen der Nutzungspraktiken und der Nachhaltigkeitsindikatoren.
9. *Schlussfolgerungen*: Notwendige Modifikationen des konzeptionellen Ansatzes?

18. Oktober 2002

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# **Valle Maggia: Institutional Regime for Water**

Adèle Thorens

Etude de cas réalisée dans le cadre du projet de recherche EUWARENESS (European Water Regimes and the Notion of a Sustainable Status) sur mandat de l'Union européenne et l'Office fédéral de l'éducation et de la Science (OFES)

## ***Résumé***

Cette étude de cas donne suite à une analyse du régime institutionnel de la ressource eau en Suisse entre 1870 et 2000. Elle étudie le changement de régime dans un bassin versant précis, celui du fleuve Maggia, durant la période allant de 1975 à 1991, période définie comme capitale dans cette analyse préalable principalement centrée sur le niveau fédéral de gestion de la ressource. Son propos est de vérifier si les tendances observées au niveau fédéral se retrouvent au niveau local. En terme de changement de régime, la période qui nous intéresse a été qualifiée de phase de complexification assortie des premières prémisses d'intégration. Si l'étendue du régime est en hausse eu égard à la prise en compte des dimensions qualitatives mais surtout quantitatives de la protection des eaux, la cohérence s'avère plus faible dans la mesure où les groupes-cibles sont plus restreints que les acteurs impliqués dans le système régulateur. Il s'agit dès lors de vérifier si ces processus se retrouvent au niveau du bassin versant, en analysant l'évolution du système régulateur (droits de propriété et d'usages) et du policy design. L'étude de cas examine ces phénomènes en décrivant trois rivalités opposant les usages locaux de la ressource, tout d'abord autour de la production hydroélectrique, ensuite dans le domaine de l'extraction de gravier et enfin en ce qui concerne la protection des biens et des personnes contre les eaux du fleuve. L'évolution du système régulateur et du policy design sont décrits pour chacune de ces rivalités, puis nous évaluons la nature du changement de régime, ainsi que son impact sur la durabilité. Les conditions de ce changement de régime au niveau du bassin versant sont enfin déterminées. Les résultats de cette étude montrent, entre autre, que nous retrouvons à l'échelle du bassin versant le mouvement d'écologisation du régime décrit au niveau fédéral. Le changement consacre enfin la prise en compte des conflits d'usage de manière globale et intégrée.

## ***Zusammenfassung***

Diese Fallstudie schliesst an eine Analyse der institutionellen Wasserregime in der Schweiz zwischen 1870 und 2000 an. Sie untersucht den Regimewandel im Einzugsgebiet des Flusses Maggia zwischen 1975 und 1991, derjenigen Periode also, die im Rahmen der genannten auf nationaler Ebene auf das Management der Ressource Wasser ausgerichteten Studie als entscheidende Veränderungsphase definiert worden ist. Die Fallstudie verfolgt das Ziel, die Umsetzung der beobachteten nationalen Tendenzen auf lokaler Ebene zu überprüfen. Hinsichtlich des Regimewandels war diese Phase auf nationaler Ebene als komplexes Regime mit ersten Anzeichen von Integration qualifiziert worden. Während sich sein Ausmass im Zusammenhang mit der Berücksichtigung von qualitativer wie auch insbesondere der quantitativen Dimension des Gewässerschutzes erhöht hat, erwies sich seine Kohärenz als schwächer, weil die Zielgruppen umfangmässig stärker begrenzt sind als die betroffenen Akteure im regulativen System. Die Analyse der Entwicklung des regulativen Systems (Eigentums- und Nutzungsrechte) und des Policy-Designs verfolgte somit den Zweck zu überprüfen, ob diese Prozesse auch auf der Ebene des Einzugsgebietes feststellbar sind. Die Fallstudie untersucht diese Phänomene anhand von drei Rivalitätsbereichen rund um die lokale Wassernutzung, nämlich die Wasserkraftnutzung, die Entnahme von Materialien aus Gewässern sowie der Schutz von Personen und Sachgütern vor Überschwemmungen. Die Entwicklung des regulativen Systems und des Policy-Designs wird für jede dieser Rivalitäten dargestellt. Anschliessend wird die Art des Regimewandels bewertet und dessen Einfluss auf die Nachhaltigkeit der Ressourcennutzung überprüft. Zudem werden die Voraussetzungen für den Regimewandel im Einzugsgebiet identifiziert. Die Fallstudie zeigt unter anderem, dass wir auch auf der Ebene des Einzugsgebietes die auf nationaler Ebene beschriebene Ökologisierung des Regimes vorfinden. Der Wandel führt schlussendlich dazu, dass die Nutzungskonflikte auf eine umfassende und integrierte Weise in Betracht gezogen werden.

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# 1. GENERAL DESCRIPTION OF THE WATER BASIN

## 1.1 GEOGRAPHICAL AND HYDROLOGICAL ASPECTS

The Valmaggia valley is the largest in Ticino, covering 1/5 of the area and incorporating 22 municipalities. The valley presents as a large funnel. The upper Valmaggia forms the upper basin and consists of three valleys spreading out in a fan: the Rovana to the west, the Bavona to the northwest and the Lavizzara to the northeast. There are a total of 12 municipalities located in the long corridor formed by the base of the lower valley from Avegno to Cavigno accounting for 4/5 of the entire population of the Valmaggia over a distance of 25 km. From Tegna, the valley ends in a vast delta plunging into Lake Maggiore at the mouth of the Maggia. In this delta, two small towns – Locarno to the east and Ascona to the west – frame the river, as it is channelled into its final stretch. There are no significant centres in the Valmaggia itself as the population density is very low (less than 20 inhabitants per km<sup>2</sup>). Economically, the valley is endowed with natural resources: its climate and landscape, which are exploited by means of tourism; stone, which is quarried to make construction materials; and, finally, water, which is used to produce energy. The active population lives and works mainly in the Locarno region, at the mouth of the river. Finally, agriculture plays only a very minor part of the economy, as the morphology of the terrain, hemmed in by steep hills, is inhospitable to this activity.

From the hydrological point of view, the water basin of the Maggia covers an area of approximately 930 km<sup>2</sup>. The course of the river runs along about 50 kilometres from the Naret lakes, at an altitude of 2,240 metres, to Lake Maggiore, at 193 metres. Its main tributaries are the Lavizzara, the Bavona and the Rovana, flowing through valleys of the same name in the upper part of the water basin. Two other tributaries, the Melezza and the Isorno flow into its waters at its final stretch. The maximum difference in altitude is found at the first 10-kilometer stretch of the river. The Maggia flows more gently from the point of its confluence with the Bavona, downstream from Bignasco. From the meeting of its waters with the Rovana, it flows at a very gentle gradient of 1% and occupies a large part of the base of the valley in a woven structure. Its last deltaic section is heavily dyked to protect the inhabitants and the infrastructure. However, this type of dyke structure affects the remainder of the river only rarely and minimumly. The average rate of flow is 24 m<sup>3</sup> per second and is strictly linked to the pluviometry. The values reach their peak in April and May, accentuated by the melting

snow; values are also very high in October. The waters of the Maggia can be as devastating as they are beneficial. The flow can be dramatically increased from time to time by extremely violent and destructive floods. The main causes of these floods are the intensity and abundance of precipitation and the fact that the gradients of the upper water basin are very steep and, in general, do not feature a layer of humus to retain the water. In terms of quality, we should stress that the waters of the Maggia count amongst the cleanest in the canton.

## **1.2 WATER USES INVOLVED**

### **Hydroelectric production**

Two hydroelectric companies operate using the waters of the Maggia. The SES (Società elettrica sopracenerina SA), a private company, currently one of the largest electrical power producers in Ticino, carries out its sampling at Avegno and Giumaglio, in the lower part of the valley and has two relatively small plants. The second much larger company is OFIMA (Officine idroelettriche della Maggia SA), a joint venture, 20% owned by the canton of Ticino.<sup>1</sup> The company carries out several samplings (it has 35 catch points in total) and runs six power plants. The total output is put at 607 MW and annual production totals approximately 1.2 billion kWh (Meier 1999: 25). OFIMA releases the waters tapped in the upper part of the Valmaggia directly into Lake Maggiore. This causes a significant drop in residual water flows over the whole course of the river. Since the advent of hydroelectric power production here, the Maggia has lost about three quarters of its initial volume of water (Meier 1999: 21). In the Riveo region, the averages for the months of June, July and August are now lower than the absolute daily minimum levels measured in the twenty-five years prior to hydroelectric production (Ufficio arginatura ed estrazioni 1999).

Geomorphological processes, transport of sediments and natural risks, alteration of the water course:

Since time immemorial, the floods have regularly wreaked their destruction on the cultivated lands and infrastructures of the region and taken victims in the valley. Today, despite the production of hydroelectric power, which has left only an extremely low residual flow rate in certain areas, summer rains can cause dramatic increases in water levels. In a matter of a few

hours the river can become the most powerful and devastating watercourse in Switzerland. The flood of 7 August 1978, following exceptionally violent precipitations, affected the whole region, causing catastrophic damage and costing many lives. At the time, the Maggia's flow was estimated to be 5,000 m<sup>3</sup> per sec. To provide protection for people and property, significant development has taken place on the final stretch since the 1980s, which had already been dyked before the disaster.

### **Support for recreational activities:**

The most important recreational activity is fishing, popular with the locals but also an attraction for many tourists.<sup>2</sup> In 1997, the catches in the Maggia and its tributaries were assessed at approximately 28,000, i.e. 4.4 tonnes of fish. Other recreational activities include canyoning and canoeing, diving from the rocky cliffs and swimming. Finally, as one of the main elements in the Valmaggia landscape, the river in itself constitutes a tourist asset. The region is popular with hikers, who appreciate its natural beauty.

### **A natural habitat for plants and animals:**

Plants and animals are particularly important in this region. The ecological and botanical features of this sub-alpine river landscape have long been vaunted.<sup>3</sup> Several zones have been listed in both cantonal and federal inventories for their ecological value.

### **Support for gravel quarries:**

The Valmaggia is the site of two quarrying operations: gravel and granite. The quarries are located mainly in a limited area between Riveo and Visletto. The average amount of gravel taken from the riverbed in this sector is 75,000 m<sup>3</sup> for the last ten years. Granite is quarried from the cliffs overhanging the Maggia. The quarries are located on the two rocky slopes on either side of the river, however the stone-processing operations take place on the banks where the largest plants and logistical structures are located. The annual yield from the quarries on the Maggia is in the region of 70,000 m<sup>3</sup> of natural stone. For this quantity of stone,

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<sup>1</sup> At present, the other shareholders are: Nordostschweizerische Kraftwerke (30%), the canton of Basel-Town (12.5%), ATEL (Aar et Tessin SA d'électricité), the Zürich municipal authority (10%), BKW Energie AG (10%) and the Berne municipal authority (5%). In addition, OFIMA is a 50% shareholder in the company, Aegina SA, which owns the Gries basin and the Altastafel power plant.

<sup>2</sup> However, there is no commercial fishing in the Valmaggia.

the total waste produced is 35,000 m<sup>3</sup>. This is due to the quarrying process itself and presence of inferior quality stone. The waste is partly used in the re-processing facilities in the quarrying area or it is dumped, in particular around the edges of the river bed, while awaiting a solution for re-use of the waste materials. Recent estimates put these granite deposits at 3-5 million m<sup>3</sup> with annual growth in the region of 30,000 - 80,000 m<sup>3</sup> (Ufficio Arginatura ed estrazioni 1999).

The Valmaggia offers other uses for the water resource but these are of less concern to us in the present instance. Uses include the consumption of drinking water, as well as provision of the strategic reserve for fire fighting and irrigation.

## 2 REGIME HISTORY OF THE WATER BASIN

### 2.1 REGIME HISTORY, MAINLY DURING RECENT DECADES

It is possible to consider changes in the regime at various levels. We analysed the historical background to changes at federal level (Reynard et al. 2000) and outline below the determining factors in relation to this case study. We also observed the changes at cantonal level and, finally, the consequences on the ground at the level of the water basin. We defined the determining period for the change of regime at federal level, the period from the mid-1970s to the early 1990s. This crucial period opens with the adoption in 1975 of *Article 24 (24 b and 24 quater) of the Federal Constitution*. This article supplements the measures already in place designed to protect the quality of the water with the obligation to extend this protection to the quantitative level. This period of change ends with the adoption in October 1991 of the *Federal Law on the Protection of Water*. This law was enacted to legislate for the requirements of the new article to the constitution and imposes, in particular, minimum residual water flow levels. In terms of regime change, this period was also characterised by an increasingly complex phase with the initial premises of integration (Mauch et al. 2000: 22). Whereas the scope of the regime may have expanded (incorporating both the qualitative and quantitative dimensions of water protection), there is little sign of coherence insofar as the target groups are more restricted than the actors involved in the regulatory system, as a result of the long delay in implementing the new article of the Constitution adopted in 1975. We have to wait until

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<sup>3</sup> (See in particular, Ceschi 1976.) Rampazzi's 1993 study had a particular impact in this domain.

1991 for the enactment of the *Federal Law on the Protection of Water* to observe coherence at this level with an obligation on the cantons to apply adequate quantitative protection measures. This change is evident at two levels: the canton and the water basins, and it may be spread out over time across the various regions. As we shall see, quantitative protection of the water resources dates back to 1976 in Ticino, anticipating the changes in the federal regime by a wide margin. At the level of the water basin, protective measures were applied in 1982, a full 10 years before the enactment of the Federal Law.

As regards the regulatory system, generally speaking, formal ownership rights have not changed. In the Valmaggia, as in the rest of the Ticino area, the water belongs to the canton. What has changed, however, is the granting of use rights by the canton, mainly in that some of these have been restricted. In Ticino, this change is implemented through amendments to *the Cantonal Law on the Use of Water* of May 17, 1894. As regards the water basin itself, 1982 saw such limitations take effect with changes to hydroelectric licenses. The study of this water basin further illustrates the changes that we paid less attention to during the study of the regime at federal level. In particular, we refer to the restriction of rights to gravel quarrying following the later suspension of the authorisations granted by the canton at the end of the 1990s.

In terms of policy design, generally speaking we observed co-ordination between the three main branches of water policy (protection against water, exploitation of the water resource and protection of the water) inasmuch as restrictions are imposed on one of these uses in the interests of protecting the other two, i.e. mainly on exploitation. In the water basin, this phenomenon is reflected in a bias in favour of the resource's function as a natural habitat over exploitation uses (such as hydropower production and gravel quarrying). A series of legislative measures, designed to protect not only the water, but also the landscape, other natural resources and fisheries, were implemented at both federal and cantonal level. We also see evidence of a compromise between protecting people and property against flooding and protecting the water as a natural habitat, developed in the context of protecting the riverbanks. In terms of instruments, changes mainly come about through changes to the regulatory system, in particular by way of amendments to concessions or authorisations with a view to limiting use rights. In addition, instruments that were initially created for other regimes, such as the land or the landscape, also had an impact on changes to the water regime. Of these, of concern to us are the Inventories (for example the *Inventory of Alluvial Sites of National Importance*) and the plans for municipal allocations. Also significant is the right to appeal granted to non-

governmental organisations representing the interests of environmental protection. Finally, we should highlight the role of a unique feature of the Swiss political system, i.e. the Popular Initiative. Changes in the target groups are based on causal hypotheses. In general, we have seen an expansion of the target groups to include all users of the resource in that quantitative protection was added to qualitative protection of the water. In terms of the hypotheses themselves, this phase consists of the application of the principle according to which nature has a formal right to protection as a natural habitat and a natural heritage. Thus, we see the scope of protective legislation for water counterbalancing the two other branches. Finally, we would draw your attention to the co-ordination efforts between the various policies that have an impact on water since the 1990s. Since this time, there has been an attempt to regulate the rivalries that exist between all of the water uses at institutional level.

## 2.2 SELECTED RIVALRIES

There are several rival uses involved in studying changes in the federal regime. Naturally, all of these will not be reflected in the Valmaggia. The rivalries to take into account at the level of the water basin do, however, reflect the main conflict evident at federal level, that is to say, exploitation versus protection. We decided to deal with three main rivalries broken down into three sub-cases:

1. Hydroelectric power production versus	- fishing
	- recreational activities and landscape
	- consumption of drinking water
	- natural habitat
2. Quarrying of gravel and granite versus	- natural habitat
	- recreational activities and landscape
	- protection against water
	- fishing
3. Protection against water versus	- natural habitat
	- recreational activities and landscape

Some uses of the water resources in the Valmaggia do not currently pose any rivalry problems, i.e. absorption of waste and irrigation. Regulations governing the first of these uses were set in place before the change period, in the framework of policies designed to protect the quality of the water. Due to the very limited agricultural activities in the area, irrigation constitutes a marginal use of water in this water basin. In addition, a fourth rivalry is not incorporated in our study as it appeared only after the change phase, at the end of the 1990s. This fourth use consists of creating artificial basins with strategic reserves to be used in case of fire. This new use of the water resource mainly rivals the priority of the area as a natural habitat.

The first rivalry concerns hydroelectric power production. This activity drastically reduces the river's runoff compromising the water's fundamental role in alluvial biotopes, causing serious damage to the aquatic fauna, deprived of its natural habitat, and thereby by extension causing damage to fishing. In the initial stages of hydroelectric production, the ground water level was actually reduced. Finally, it constitutes a threat to the Valmaggia landscape, as the river is the primary element in this landscape.

The second rivalry is the conflict between gravel and granite quarrying operations and the natural habitat and fluvial dynamics, inasmuch as quarrying alters the Maggia riverbed and its banks. In addition, these activities disturb the aquatic fauna, hence the rivalry with fishing. They change the alluvial landscape and result in hydraulic safety problems disrupting the equilibrium of the riverbed.

The third and final rivalry we will deal with concerns the need to protect people and property against the sometimes catastrophic flooding of the Maggia, a need that conflicts with maintaining a certain natural river dynamic and an environment that promotes the water fauna and flora native to the area, and, therefore, the natural habitat. In addition, the dykes constitute a threat to the landscape functions of the alluvial area.

### **3 REGIME CHANGES: SUBCASE 1: HYDROELECTRIC PRODUCTION**

#### **3.1 CHRONOLOGY**

The decision of the canton of Ticino to expand production of hydroelectric energy, which had been a modest feature of the Valmaggia since the dawn of the 20th century (SES concession), dates back to the early 1950s . The members of the Ticino Grand Conseil [Regional Council] voted unanimously to grant a major concession to tap the Maggia hydroelectric resources. This concession was granted to OFIMA. The ecological consequences of this decision did not enter into the equation at that time. Income from the hydroelectric concession was an important source of revenue for the canton. The construction works and operation of the plants created employment in a region which was hitherto relatively undeveloped. In 1965, with the completion of the first phase of the works and the second phase ready to start, the first signs of damage to the hydric system and to the landscape were noticeable. The water was extremely scarce, especially in summer, and the little remaining water seeped. The ground water level fell, creating problems with drinking water suppliers. The main reaction came from fishermen but also from private individuals and state bodies. The Fisherman's Federation published an alarming report purporting that the catch system works had caused irreparable damage to the fishing areas.

The cantonal authorities took the situation in hand by initiating studies in partnership with the hydroelectric companies. Their goal was to define the minimum residual flow rates acceptable to the companies to avoid claims for compensation. According to the *Federal Law on the Use of Hydroelectric Power of 22 December 1916*, any infringement of use rights gave rise to the payment of compensation by the authorities, an outcome which the latter quite naturally hoped to avoid. The canton and OFIMA entered into a provisional agreement between 1969 and 1973 and the first minimum residual flow rates became effective, without, however, any specific basis in law.

Nonetheless, the fishermen persisted in alerting public opinion and in demanding higher guaranteed levels. The public debate continued in this way into the 1970s. The same is true at the political level, especially in the Grand Conseil. Council members denounced the excessive use of the water resources to the detriment of the local population citing the “energy barons” as the only beneficiaries. Public opinion became increasingly mobilised against what was

considered to be the squandering of resources. In 1975, having written open letters to the authorities, demanding increased residual water flow rates, without success, the Fisherman's Federation launched a Popular Initiative. The purpose of the Initiative was to amend canton legislation and to introduce a new article into the *Cantonal Law on the Use of Water* which would force the canton to guarantee sufficient minimum residual rates when it grants a concession, taking into account drinking water needs first and foremost, but also fishing, the protection of the water and the natural environment (the requirements of agriculture and industry are also referred to in the Initiative but are not relevant to the Valmaggia). The Initiative passed with ease and, in December 1976, the cantonal parliament voted in favour of the new Article 8b. From then on it was a question of accurately defining the residual water flow rates to be imposed on the ground. With OFIMA's agreement, the Council of State proposed increasing the minimum residual water flow rates by 1%, without compensating the hydroelectric companies. However, in October 1982, the parliament rejected this proposal and instead passed a statutory order setting the increased residual water flow rates at approximately 2% for current and future concessions (DL 1982). All concessions were then re-specified and the residual water flow rate modified for each catchment.

September 1983, saw OFIMA submit a legal action in the Federal Courts demanding compensation from the canton. There ensued a legal dispute which would not be resolved until the 1990s. The issue has now been settled by a judicial agreement finalised before the Federal Court in June 1996. In this agreement, the canton acknowledges that the reductions imposed in 1982 were part of the watercourse drainage measures, which anticipated the measures provided in the *Federal Law on the Protection of Water* of 1991. The corresponding loss of production for OFIMA was 2.4%, for which no compensation was provided. Nonetheless, compensation will be paid for any additional drainage measures.

The *Federal Law on the Protection of Water* imposed a new minimum residual water flow rate in the early 1990s. This new minimum is very low (minimum of 50 litres/second), but is compulsory for all watercourses and must be imposed when concessions are renewed. In addition, the canton can increase the level, as dictated by the interests of the time. Article 80 specifies two different situations: generally speaking, the canton must set a new compensation water level, i.e. the quantity of water required to maintain sufficient residual flow after sampling, applicable to all uses. Nonetheless, the canton must complete specific scientific studies to determine the minimum residual water flow rate in the zones judged to be of high environmental value, in particular, the listed zones. These studies consist of inventorying the catch

systems and producing a report on the relative weighting of the different interest groups. It may then demand a higher residual flow rate to ensure the protection of these conservation areas. This additional requirement could result in compensation for the company or companies whose use rights are restricted. Thus, it was solely up to the canton to decide on the drainage needs of the water courses, except where a water course crosses a listed area, of which there are several in the Valmaggia, defined in accordance with the *Decree on the Protection of Alluvial Zones*. The federal authorities monitor the cantons' activities and compile the inventories and drainage reports. During the 1980s, Ticino had already set up a “minimum residual water flow rates” working group, co-ordinated by the cantonal Department for Air and Water Protection. As the canton then decided that the measures undertaken at that time did not fully comply with the requirements of the new *Federal Law on the Protection of Water*, it undertook a reform of the working group during the 1990s. The group was re-vamped to include representatives from the fishery protection and nature conservation departments, as well as the hydrological and finance departments (energy). Ticino submitted its inventory of the catch systems to the OFEFP, the federal Office for the Protection of the Environment, Forests and the Landscape, in May 1997. The second report on the relative weighting of the various interest groups in the ecologically protected areas is currently being prepared. The study is scheduled for completion in 2002.

Negotiations are finally taking place between the canton of Ticino and the hydroelectric company, SES, to redefine the parameters of the concession for the Avegno tapping stream. The initial attempt to reach agreement encountered opposition from the WWF and the Fisherman's Federation which are demanding accurate calculations of the minimum residual water flow rates.

The change at the level of the water basin consists of the following developments. A change in design policy, as a result of the Fisherman's Federation's Popular Initiative, introduced the quantitative protection of the water resources at cantonal level in advance of other legislation. This phenomenon resulted a few years later in restricting the hydroelectric companies' use rights, in favour of the other functions of the water, i.e. landscape, natural habitat and fishing.

The table below summarises the course of the changes in the policy design and regulatory system.

	Policy design	Regulatory system
1975	Introduction of Art. 8 b into the <i>Cantonal Law on the Use of Water</i> , following a Popular Initiative: from this point forward the canton was obliged to guarantee that sufficient residual flow levels are maintained	
1982	Statutory order applying minimum residual water flow rates to be imposed on the ground for each catch system (DL 1982).	Modified all concessions in Ticino, including those in the Valmaggia, and restricted the hydroelectric companies' use rights.
1991	<i>Federal Law on the Protection of Water</i> : Imposed minimum residual water flow rates at federal level. These may be more restrictive in listed areas, hence the strong probability of further reductions in use rights for hydroelectric companies in the future, when concession licences are renewed.	
1992	<i>Decree on the Protection of Alluvial Zones</i> : Several zones in the Valmaggia were listed as being of high ecological value. Additional measures should be taken to conserve them.	
2000		First concession renewal in Valmaggia since the introduction of the <i>Federal Law on the Protection of Water</i> . The WWF and the Fisherman's Federation opposed the renewal and demanded higher minimum residual water flow rates than the values calculated by the canton.

### 3.2 ASSESSMENT OF REGIME CHANGE

It now remains to assess these changes according to the five dimensions of governance and co-ordination between the regulatory system and policy design.

**Dimension 1: Administrative co-ordination for the water basin. To what extent does the regulatory system and policy design take into account the resource at the level of the water basin?**

In Switzerland, there is no water management structure at the level of the water basins, either as regards ownership rights or as regards local policies. As we have already seen, decisions that are of vital importance to the water basin in question are taken at the level of the canton, the owner of the water and the body with responsibility for implementing federal legislation. Decisions are made without the involvement of any representatives from the valley itself. Furthermore, there is no federal involvement in important decisions concerning changes, which are truly centred on the canton. Therefore, we could say that efforts to incorporate and resolve rivalries associated with hydroelectric production take the use function and the problems arising from it as their starting point, rather than the water basin. Nor do such efforts focus on any form of vertical co-ordination that would link the water basin, the canton and the state. An example of this type of use-centred management is the creation at cantonal level of a multi-disciplinary working group on minimum residual water flow rates. The problem of the impact of hydropower affects all of Ticino. The authorities have, therefore, concentrated on this particular use within the canton, an area that includes several water basins. However, following developments in the regime, it is possible to detect increasingly sustained attention to the notion of water basin, especially in terms of policy design, inasmuch as there is a realisation that samplings upstream have a negative impact on the entire course of the water, in particular on the listed alluvial zones located downstream. Thus, there is an increasing tendency for the cantonal authorities to consider the resource as a geographic whole, as a coherent hydric system and, therefore, as a water basin, even given the absence of an administrative structure for each basin.

**Dimension 2: Involvement of all interested actors. To what extent does co-operation exist between the actors involved in public policy and the users of the resource? To what extent do private actors have a stated position and the ownership rights to back up this position?**

In this particular sub-case, we consider the level of co-operation between the various actors involved to be high, at least at the beginning of the change process. In fact, the hydroelectric companies have continually maintained an often fruitful co-operative relationship with the cantonal authorities, especially in the early 1970s. During this period several tests to define

satisfactory minimum residual water flow rates were carried out informally, outside of any compulsory legislative framework. However, the 1980s marked a hardening of relations, when OFIMA challenged the minimum residual water flow rates imposed by the canton in its Statutory Order of 1982. It must be said that these companies are in a fairly advantageous situation in terms of defending their use rights given that the law does theoretically guarantee them compensation if these rights were to be limited. The other non-state actors involved in this sub-case are the fishermen, whose federation is both well-organised and respected in the canton. Before the change, they did not have any formal use rights with which to defend their position, but they used the resources of the Swiss political system through the Popular Initiative. They would then be consulted on a regular basis by the canton as users of the resource. Finally, environmental protection associations, such as the WWF, who took up a position in defence of the resource as a natural habitat, became involved in the changes to the regime through the right to appeal granted to it in 1996 through Article 12 of the *Federal Law on the Protection of Nature, Landscape and Cultural Heritage*. In addition, these associations are regularly consulted by the canton as part of the decision making process.

**Dimension 3: Scope. To what extent do public policies incorporate all uses of the resource?**

Significant change is evident in terms of scope. Before the period of change, only exploitation of the water resource was incorporated. The concessions granted to the two hydroelectric companies did not include any special provisions designed to protect the resource's natural habitat, landscape or recreational functions (such as fishing). The concessionaire simply undertook to comply with all measures in force and, as we know, at that time there was no legislation in force covering the quantitative protection of the water resources. However, when we come to the 1980s, the restriction placed on these use rights marks a profound change in policy design towards what could be termed a “greener” approach. Rival uses were recognised and incorporated into the framework of various bodies of legislation, both at federal and cantonal level. It is not only the laws directly controlling the specific management of the water that are at issue, but also the changes in environment protection legislation designed to protect the natural resources, landscape and fishing. As regards the Valmaggia itself, the most important change in this process of extending the scope of the regime is, of course, the adoption of Article 8 b of the *Cantonal Law on the Use of Water*, which introduced quantitative protection of water including additional uses, such as natural habitat, support for recreational activities,

such as fishing, and the safeguarding of the water's function in the landscape. Ticino already had legislation designed to protect the landscape on its statute books since 1940, but this legislation had never been amended to cover use of the water for hydroelectric production. This change at cantonal level found support at federal level with the *Law on the Protection of Water* of 1991, which also covered the uses referred to above and the *Federal Inventory on the Protection of Alluvial Sites*, designating several parts of the Valmaggia as areas of national value and protecting them as a natural habitat. Finally, following the *Federal Law on Fishing of 21 June 1991*, Ticino repealed the former fisheries law and in 1996 promulgated the *Cantonal Law on Fisheries and the Protection of Indigenous Fish and Crayfish*. A feature of all of these different pieces of legislation is the promotion of the natural habitat, landscape functions and recreational uses, such as fishing, at the expense of hydroelectric production. Thus, the scope of the regime has increased and, at the end of the change period, all of the effective uses of the waters of the Maggia have been incorporated into policy design, legitimising the restrictions on use rights for hydroelectric production in favour of competing uses.

**Dimension 4: Coherence To what extent do policy measures target all users of the resource and, more specifically, the players of central importance for change in that they hold the determining ownership rights? What redistribution of use rights is evident in this context?**

Coherence, like scope, has also improved. Before the changes, policy design took into account only those who had use rights for the water. At the time, the underlying hypothesis for policy was to stimulate local development. The operating hypothesis was to grant concessions covering the Maggia. Other users were not taken into consideration. For example, the authorities had no idea of the impact of hydroelectric power production on another aspect of the local economy, tourism, which relied on the Maggia's landscape functions. The natural habitat was neglected as was the recreational use of fishing, which has a strong presence and is quite visible. Tourists, the fauna and flora, as well as the local population, including the fishermen, had no formal use rights and did not enter into policy considerations. During the period of maximum conflict between the various uses, coherence could be said to be non-existent. After the change, it is possible to observe a change in the underlying hypothesis. From the mid-1970s, the focus was the coexistence of the valley's main economic activity, hydroelectric production, and the competing uses for the resource, i.e. natural habitat, functions and recreational uses. Thus, informal users were acknowledged and incorporated into policy. In order to re-

spect what we could term their “informal use rights”, from now on viewed as legitimate, the new underlying hypothesis targets those judged to be holders of excessive formal use rights, i.e. the hydroelectric companies. Limits were placed on these rights by amending the terms of the concessions. After the change, policy design takes all users into account and policy is now aimed at key actors in the regulatory system, resulting in a clear improvement in coherence within the regime. This coherence developed a very low level at the heart of the use conflict to reach a degree of balance once all uses of the resource are considered.

**Dimension 5: Co-ordinating the application of the measures at the level of the water basin. To what extent do public policies rely on public organisations and resources for their implementation and to what extent do these use the regulating capabilities inherent in the ownership rights belonging to the regulatory system? In other words, is implementation from the top down or does policy facilitate a bottom-up approach by users themselves by granting them certain ownership rights?**

As we have seen, the very process of change itself can be traced to a bottom-up approach in the sense that a Popular Initiative on the part of some water users, neglected by the regime, was at the root of the change. Nonetheless, we can describe the implementation as top-down, given the role of the state and various restrictive federal laws during the 1990s. In terms of the regulatory system, the actual change itself, i.e. the statutory order of 1982 followed by the amendments to the concession licences, were passed by the canton, the owner of the resource, reacting to popular demand. However, the implementation of these measures is supported by changes to policy issued at the federal level of the regime (in particular the *Federal Law on the Protection of Water* and the *Inventory of Alluvial Sites of National Importance*). From then on, the process takes place under the aegis of the state. The canton is answerable to the state for the way in which the new legislation is implemented, including regulations on the minimum residual water flow rates, which at the outset were cantonal measures. However, it is important to recall that, in Switzerland, the consultation process involves all those affected by the decisions, which is effectively the case in the Valmaggia. At local level, there is broad participation by water users in the overall process. They are regularly consulted and often participate in the various working groups set up by the administration.

### 3.3 CONTRIBUTION TO SUSTAINABILITY

At this point, we must ask ourselves if the change to the regime has truly contributed to more sustainable use of the water at the level of the water basin. In the case of the Valmaggia, we can fairly safely assert that this is indeed the case, at least in the context of this sub-case and relatively speaking. The introduction of quantitative protective measures for water as part of policy design coupled with the restrictions placed on the hydroelectric companies' use rights arising from these measures have had a real impact on the ground. The descriptions of the condition of the Maggia before the regime change make alarming reading. Entire stretches of the river were totally dried up, the ground water level had dropped and the landscape was so changed that the local population mobilised against an activity that is nonetheless the main source of employment in the valley. An improvement was perceptible immediately after informal minimum residual water flow rates were set in place, especially in terms of the ground water level. From the 1970s, we no longer hear talk of a conflict between hydroelectric production and supplies of drinking water. Even though the minimum residual water flow rates have proved their effectiveness on the ground, their precise determination remains a major challenge. It is a question not only of defining those uses on behalf of which limits should be placed on hydroelectric production, but also of assessing their quantitative water requirements. Whereas it may be relatively easy to calculate the drinking water requirements for the valley, this is far from the case for other competing uses. For example, how much water does the Maggia need for its nature and landscape functions in the Valmaggia? How much does it need for fishing? How much water is needed in a given stretch to ensure it can satisfactorily fulfil its role as a natural habitat? These are extremely complex scientific issues (biological requirements) and they also have a certain subjective dimension (landscape and beauty) or even a political and economic dimension (promotion of tourism or recreational fishing, respect for the local population's aspirations, energy policy, etc.). It is just such a "relative weighting of interests" with a view to sustainable resource management that the canton of Ticino has been attempting to achieve since the 1970s. This aim prompted the commissioning of numerous reports, as well as the creation of mixed working groups representing the different interest groups. Here we encounter the eternal difficulty inherent in what is known as sustainable development, that is to say reconciling the opposing social, economic and ecological dimensions of the issue. At this very moment two studies are currently underway in Ticino, arising from the provisions of the *Federal Law on the Protection of Water*. One centres on defining allocation criteria that will be acceptable to the hydroelectric companies but that will

also effectively protect the environment in the listed areas. The subject of the second study is the socio-economic impact, especially on fishing, of any possible additional requirements in terms of minimum residual water flow rates. For our part, we can state that currently, after the change in the regime, fishing and tourism seem to be flourishing in the valley. Nonetheless, it is impossible to state accurately to what extent this is due to the implementation of minimum residual water flow rates. In terms of sustainable economic development, compensation paid out by the federal authorities will compensate for the loss of production caused by the limits placed on the hydroelectric companies' use rights, as a result of implementing Article 80 of the *Federal Law on the Protection of Water*. In addition, the canton will have to confront the restriction on its own revenues, as any drop in hydroelectric productivity translates into a reduction in the license fees it receives from these companies. At present its policy is to revise the *Cantonal Law on the Use of Water* to gradually re-appropriate the use rights granted and to take on the management of the resource it owns. Finally, accurate data is not available to enable us to assess the impacts of the changes to the regime in terms of the overall ecology of the water basin. According to the Ticino branch of the WWF, the minimum residual water flow rates imposed since the 1970s have, naturally, had a beneficial effect for the fauna and flora. However, it considers more demanding restrictions necessary, especially in the listed alluvial zones. In this regard, the WWF is concerned at the slow pace of renewing concessions in the Valmaggia. The calculation of the flow rates is also a source of anxiety for environmentalists. Thus, the overall ecological effects of the regime change are relatively positive, with room for improvement. The Maggia is still short of water today.

### **3.4 CONDITIONS FOR REGIME CHANGE**

The swift introduction of minimum residual water flow rates in the Valmaggia during the 1970s, fifteen years before their incorporation into federal policy, owes much to the level of awareness and the commitment of the local population. The role of the Fisherman's Federation, a well-organised and motivated local organisation that is recognised by local actors, has played a major role in building awareness of the issues and in channelling popular discontent. The Ticino press also gave wide coverage to this movement. The actual change to the regime was made possible by the use of a very efficient element of the Swiss political system, the Popular Initiative, launched by the Fisherman's Federation. This enabled the rapid amendment of policy. Furthermore, we should stress the fact that change to the regime was also promoted by the co-operation between the hydroelectric companies and the administration

that marked the beginning of the period of change. As the deterioration of the resource was particularly visible, the problem could only be eluded with great difficulty. In addition, in all likelihood, the WWF played a role by commissioning a study on the ecological value of the Valmaggia, which contributed to showing that the region was deserving of protection (Rampazzi 1993). Finally, difficulties encountered in implementing the changes, such as the legal dispute between the canton and OFIMA, were partly overcome by the change to policy design at federal level, which supported the canton's decisions. The fact that several zones in the Valmaggia were listed as being of national importance was also significant. The WWF's and Fisherman's Federation's opposition to the recent renewal of the SES concession, for which there were irregularities in the calculation of the minimum residual water flow rates, underlines the important role in the implementation of such measures of the right to appeal enjoyed by environmental protection associations. One last point we would stress is that OFIMA concerns only the local public authorities, including the canton of Ticino, and not private shareholders. It is likely that this fact also came down on the side of change.

## **4 REGIME CHANGES: SUBCASE 2: GRAVEL AND GRANITE QUARRYING**

### **4.1 CHRONOLOGY**

We will concentrate on the events that affected the particularly conflict-ridden area of Riveo-Visletto, just downstream from the confluence of the Rovana and the Maggia. We would first of all specify that the pace of change affecting this sub-case was uneven in two respects. On the one hand, the change at policy design level was steady and slow and not concentrated in what we determined as the change period. It was already underway during the 1970s, especially at cantonal level, and intensified during the 1990s. On the other hand, at the level of the water basin, changes did not become effective until after the pre-defined change period, through limits placed on quarrying rights, which were not implemented until the end of the 1990s.

As far back as the 1980s, the Rivo-Visletto sector drew the attention of the canton of Ticino due to the problem of the mineral waste deposits from the granite quarries. This debris had

been deposited directly at the edge of the Maggia, without any authorisation whatsoever, and in contravention of the existing legislation in force for the protection of the riverbanks. The problem has only finally been tackled in the last few years as a result of several events. In terms of planning first of all: the districts of Someo and Cevio were revising their land allocation plans and an overall guideline plan for the entire valley is being formulated. On the other hand, several infrastructure projects to protect the area against flooding were planned in the area in places that have not been restored since the floods of 1978. These projects drew attention once again to the Riveo-Visletto area. At this point, several local actors began to worry about the situation. In 1997, the Someo town council requested a meeting with the Director of the Planning Department who commissioned a firm of engineers to conduct an in-depth survey of this sector. The report was completed in 1998 and became the reference document for what was recognised as a true conflict of use from that point onwards. In fact, it became evident that the problem of granite waste deposits is not the only problem in this sector. Other issues to contend with are gravel quarrying, which proved to be excessive, as well as the protection of listed alluvial zones. These conflicting interests are concentrated in a small area and are intimately interlinked. The report illustrates that this situation is not only complex but completely disorganised. The various activities exist in parallel marked by an absence of coordination and in an atmosphere of complacency, both on the part of the local authorities and the companies involved.

For quite some time, at cantonal level, policy has provided a regulatory framework for the conflict between gravel and granite quarrying and other uses, such as the area's function as a natural habitat and its geomorphological, natural beauty and landscape functions:<sup>4</sup> In accordance with this legislation, at the beginning of our reference period, quarrying should already be under the control of the cantonal Department of the Environment, in compliance with the ground water level. In the event of damage, the operator bears responsibility. Between 1975 and 1991, policy design continued to evolve in this same direction, that is towards the recognition and development of uses competing with quarrying, mainly by means of legislation enacted to protect the landscape and natural resources, and more especially through legislation which recognises the value of the riverbanks – often the site of the quarries – as a natural habitat. Finally, during the 1990s, this “greening” of policy intensified, at both federal and

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<sup>4</sup> The Cantonal Statutory Order regulating Quarrying in Lakes, Rivers and Streams, 1928, the Cantonal Executive Decree on the Extraction of Materials from Public Waterways, 1966, and the Regulation on the Excavation and Extraction of Materials in the framework of the Protection of the Water of 1969.

cantonal level, with the *Federal Law on the Protection of Water*, which underlined the importance of geomorphological issues over mining activities, the *Inventory of Alluvial Sites of National Importance*, which designates the Riveo-Visletto as a site of ecological value, and the federal and cantonal legislation on fishing, which protects the natural habitat of the fish. In addition, the canton regulates quarrying in the framework of the *Cantonal Law on Building*, which requires a detailed planning authorisation and a plan for restoring the area for all mining or quarrying activities. In short, the complete process of developing a more environment-friendly policy should have resulted well before the 1990s in limiting the gravel quarrying rights granted by the canton, as well as in prohibiting the dumping of granite waste on the banks of the Maggia on the part of the municipalities. In reality, in the Riveo-Visletto sector, authorisations were granted for decades in a more or less informal fashion and without any related requirements.

Aware of this gap, in 1998 the canton commissioned two surveys to assess the environmental impact of past and present operations. The first was a gravel quarrying plan for the Riveo-Visletto sector (Ufficio arginatura e estrazioni 1999a), assessing the quantities that could be extracted based on the amounts of materials borne by the river. The second survey concentrated more specifically on the impact of the quarrying on the area's functions as a natural habitat (Ufficio arginatura e estrazioni 1999b). These two reports are implacable in their conclusions: the ecological situation in the area is alarming. In particular, following changes to the river upstream in an attempt to solve a landslide problem in the Val di Campo, the sediment inputs into the Rovana are about to drastically fall, thereby reducing the possibilities of sampling at its confluence. An immediate halt to gravel quarrying and a swift solution to the problem of granite debris deposits are inevitable. The vast majority of current authorisations, generally covering short periods of one year, have been suspended by the canton in the interests of the general public. It now remains to find a solution for ceasing this activity that will not spell economic disaster for the region. Furthermore, gravel quarrying offers only meagre possibilities. Following the implementation of *the Decree on the Protection of Alluvial Zones*, which is of particular interest to this area, it is no longer possible to authorise gravel quarrying for reasons of hydraulic safety or renaturation.

To date, there are several solutions under negotiation. This follows a process of consultation extended to all actors involved in a climate of reciprocal co-operation. The first possibility concerns the renaturation work planned in the framework of the application of the *Decree on the Protection of Alluvial Zones*. At this very moment, an inter-departmental group is work-

ing on the issue and there is consultation with the towns concerned. Another approach links both of the valley's quarrying activities, gravel and granite. In fact, there are two opposing phenomena at work in the area: on the one hand, gravel quarrying, which exceeded the declared 600,000 m<sup>3</sup> in one decade and, on the other, the production and depositing of granite waste, in more or less the same quantities. We noted on the one hand, the lack of availability of gravel of fluvial origin and on the other, the increase in the deposits of material which is practically identical in its mineral composition, the depositing of which is problematic for environmental and hydraulic safety reasons. Consequently, the solution is self-evident: re-processing and grinding of the quarry waste to make it re-usable in the place of the gravel quarried from the river. There is now an agreement between the gravel and granite quarry operators and the procedure seems to work well. Finally, the gravel-quarrying sector could be used in the works related to hydraulic safety. In some respects, these various projects constitute a transfer of the use rights that had been granted for quarrying activities to new areas of use highlighted by changes in policy design, even if the same companies are involved. They no longer simply produce a construction material, but also recycle the granite waste, thus ensuring the hydraulic safety of the riverbanks by clearing them of dangerous obstacles. By the renaturation work, they are also contributing to renewing the natural habitat and to developing geomorphological uses of the river by restoring the banks.

The change in the regime may be described as follows: policy design increasingly incorporates uses that compete with quarrying. Although it comes late for the water basin being studied, this change has led to the suspension of the use rights granted by the canton to the gravel quarrying companies and their re-allocation to competing uses, which have long been emerging as part of policy. The table below summarises a few important stages in the development of this change during the pre-defined stage, in the larger meaning of the term. We should remember that before the 1960s measures already existed at cantonal level to reconcile quarrying to a certain extent with rival uses.

	Policy design	Regulatory system
1966	<i>Federal Law on the protection of Nature, the Landscape and Cultural Heritage</i> : stressed that the banks should be protected as a natural habitat.	
1974	<i>Cantonal regulation in application of the Statutory Order of 1940 on the Protection of the Natural Heritage and the Landscape</i> : required protection of the riverbanks.	
1991	<i>Federal Law on the Protection of Water</i> : quarrying may not affect the ground water level and may not negatively influence the sector's material resources.	
1991a and 1992	<i>Cantonal Law on Construction and Regulations for its Application</i> : requires a specific plan for applications for quarrying authorisations, including a restoration plan for the area.	
1992 and 1995	<i>Decree on the Protection of Alluvial Zones and Guide to Application</i> : lists the Visletto-Riveo quarry area. Quarrying must be linked to hydraulic safety and renaturation.	
1996	<i>Cantonal Law on Fishing and the Protection of Indigenous Fish and Crayfish</i> : even when authorised, technical operations, including quarrying, that damage the fish are punishable by the payment of compensation. Required the fish's natural habitat to be protected.	
1999		Suspension of the majority of quarrying rights in the Riveo-Visletto sector.
2000		These use rights were transferred to other activities, associated with hydraulic safety, recycling of granite waste and renaturation.

## 4.2 ASSESSMENT OF REGIME CHANGE

It now remains to assess these changes according to the five dimensions of governance and the co-ordination between the regulatory system and policy design.

**Dimension 1: Administrative co-ordination for the water basin. To what extent does the regulatory system and policy design take the resource into account at the level of the water basin?**

As we saw with the conflict surrounding hydroelectric power production, there is no specific and permanent structure at the level of the water basin to control the impacts of gravel quarrying in the Valmaggia. Furthermore, there is no true vertical co-ordination between the water basin, the canton and the state. On the other hand, we should stress the creation of the inter-disciplinary working group at the inception of the transfer of use rights that took place at the end of the 1990s. This group does not operate on the scale of the whole basin, but does incorporate the conflict zone itself and the potential for several uses to co-exist there. Nonetheless, the process of reflection ushered in by this group highlighted the gaps in planning and in the definition of the ownership rights to the land in the region. This increased awareness would seem to give rise to a will to view the Valmaggia as a whole, at least in terms of land allocation. Although this process does not have a direct impact on the resource water, it will probably have an influence on how it is managed inasmuch as it could lead to the protection of certain areas along the river by the towns. Finally, it is worth remembering that at policy level, as with the previous sub-case, we are witnessing the emergence of the notion of the water basin as a whole meriting consideration above and beyond more localised issues. One example of this process at work is the incorporation of development work upstream when defining the volume of gravel that may be quarried in the Riveo-Visletto sector.

**Dimension 2: Involvement of all interested actors. To what extent does co-operation exist between those involved in public policy and the users of the resource? To what extent do private actors have a stated position and the ownership rights to back up this position?**

It could be said that there is a high level of co-operation between public representatives and users of the resource, as witnessed by the formation of a working group with representatives of all the actors, including the economic sectors, the municipalities and leading figures in the community, as well as the various cantonal departments concerned. Other more peripheral players were also included in the reflection process, such as the large hydroelectric companies, whose use of the Maggia upstream compounds the impact of the quarrying activities in the alluvial zone, or specialist companies engaged in the production of reinforced

concrete using the gravel from the area in the process. The quarry companies, who saw their use rights suspended and then transferred, found themselves in a more difficult situation than the hydroelectric companies. Their use rights were only guaranteed by authorisations that were valid in the short term. In the event of the cancellation of their rights, no compensation was payable. Nonetheless, their position was strengthened later on in the framework of the working group whose deliberations resulted in the transfer of their use rights to other sectors. The chief defender of these rival areas or uses (natural habitat and landscape functions, geomorphological uses) within the working group was the representative of the *Office de la protection de la nature* [the Swiss Nature Conservation Office]. In addition, engineering and consulting firms had an important role to play through their reports highlighting the insufficiencies in policy design to cope with the management of these various uses. They supported recognising the informal use rights associated with the natural habitat and landscape functions, as well as geomorphological uses.

**Dimension 3: Scope. To what extent do public policies incorporate all uses of the resource?**

The regime is moving decidedly towards a progressive expansion of scope, inasmuch as policy incorporates uses such as natural habitat, landscape and geomorphological functions to the detriment of quarrying. If we limit our considerations to only the pre-defined change period, then what stands out is the discovery of the importance of geomorphological uses. This primacy resulted in Article 44 of the *Law on the Protection of Water*, which confirms that quarrying may not take place if it has a negative impact on the balance of materials. In addition, it is mainly on the basis of this article and a study on the balance of materials in the Riveo-Visletto sector that it was possible to suspend use rights. We saw that another use considered as important in the valley was hydroelectric production, in the management of the Riveo-Visletto local conflict. At the end of this change period, policy effectively covered all uses and sought to achieve co-existence.

**Dimension 4: Coherence. To what extent do policy measures target all users of the resource and, more specifically, the players of central importance for change in that they hold the determining ownership rights? What redistribution of use rights is evident in this context?**

Before the change a very low level of coherence is evident in that policy design does not take the key players into account, thus the conflict on rival use rights. The policy target group then became the holder of determining use rights, i.e. the quarrying companies. As we have seen, what we are witnessing is a form of redistribution of their use rights. If these rights are still granted, they must be to the benefit of the natural habitat and geomorphological functions. Thus, we can say that there is an increase in coherence at the end of the period of change, even though its impact on the regulatory system took a long time to manifest itself at water basin level (time lag between the change in policy design and the placing of limits on use rights).

**Dimension 5: Co-ordinating the application of the measures at the level of the water basin. To what extent do public policies rely for their implementation on public organisations and resources and to what extent do these use the regulating capabilities inherent in the ownership rights belonging to the regulatory system? In other words, is implementation from the top down or does policy facilitate a bottom-up approach by users themselves by granting them certain ownership rights?**

In this second sub-case, we are witnessing a process comparable to the one we described in the context of the first sub-case. At the outset of the change, local players were worried (in this instance the municipalities, responsible for the management of the granite quarries). They realised that their informal manner of managing the use rights was problematic. Support at cantonal level was needed and this is what triggered the process of change following the two expert reports it commissioned. These led to the suspension of the granite quarry operators' use rights and the resolution of the problem of granite waste being dumped on the riverbanks. However, the transfer of the use rights that enabled these two problems to be linked and thus resolved resulted from a very localised process, i.e. the formation of a working group with representatives of all users concerned by the conflict. Finally, we should emphasise the important role played by federal legislation, not only in slowly changing policy but also in the implementing of policy at the level of the water basin. In all probability, the fact that the Riveo-Visletto zone was listed as part of the *Inventory of Alluvial Zones of National Importance* played a key role in implementing policy requirements by supporting the promotion of other competing uses and by positing the state as the guarantor for these rival uses. The change process then presents as a complex process. Its origins are rooted in what could be described as a bottom-up approach (demand for support from the municipalities). Change

was then managed by the canton, but with the co-operation of local users in the form of a working group. Finally, support came from the federal level in the form of back-up for implementing the changes.

### **4.3 CONTRIBUTION TO SUSTAINABILITY**

As actual change at the level of the water basin is a very recent phenomenon, it is very difficult to draw any conclusions regarding its contribution to the sustainable development of the resource. The firm of consultants responsible for the environmental impact study on the effects of the quarrying operations set several criteria. Failure to meet these criteria means the suspension of any new authorisations. In particular, these criteria concern the presence of certain vegetation (pioneer vegetation), the existence of a sufficient number of arborised islands and the presence of at least 2,400 – 2,800 m of water courses in a woven structure in the area. In addition, geomorphological uses must be guaranteed by a sufficient supply of sediment. To date, these various conditions have not been fulfilled. Moreover, it is probable that it will take some time to re-establish a situation of relative ecological balance. Only a large flood could provide a new supply of sediment in the area and redress the balance of materials which, to date remains a negative one. The general condition of the sector has also contributed to more or less restrictive management of hydroelectric production and the implementation of minimum residual water flow rates. Nonetheless, one could consider that the change in the regime with respect to quarrying, and more specifically, the limitation and transfer of the use rights as a consequence, can only contribute to improving the ecological balance sheet in the area in the medium term. The progressive application of the *Decree on the Protection of Alluvial Zones* should reinforce this process. At an economic and social level, we should stress the ingenuity of the solutions proposed by the inter-disciplinary working group. In fact, transferring use rights enabled the region to avoid an economic disaster, saving jobs and creating a new niche for local businesses. The canton is actively engaged in supporting the production of gravel using a large portion of the granite waste. Finally, management of the Riveo-Visletto area may be considered as a fairly successful attempt at achieving co-existence in a limited sector for a large number of rival uses, taking into account the ecological, social and economic dimensions as required by the notion of sustainable development.

#### 4.4 CONDITIONS FOR REGIME CHANGE

Consideration of the elements that helped to bring about effective change in the Riveo-Visletto sector, elicits the following comments. We want to show what finally triggered change at the level of the water basin at the end of the 1990s while actual changes in policy design should have enabled such change well ahead of this time.

First and foremost, we should stress the fact that the initial impulse for the resolution of use conflicts in the Riveo-Visletto sector originated in the implementation of public policy for the land regime through the planning system. When it came became apparent that gravel and granite quarrying was carried on outside of any area zoned for this type of activity (craft industry zone or construction zone), the municipalities requested the canton's assistance. Furthermore, the problem of dumping granite waste, a highly visible issue, triggered the initial consultations. These consultations play a particularly important role in the change process. They provide the data leaving no doubt as to the gravity of the situation. They also highlight the environmental impact of the quarrying activities and the fact that they are totally out of line with policy developments, making the issue impossible to ignore. The cantonal authorities were now informed and could specify the causal and operating hypotheses leading to the suspension the quarrying companies' use rights. The swift pace of their reaction should probably be seen in relation to the fact that these activities conflict, particularly with geomorphological uses, and thus compromise hydraulic safety in the sector. The risk of flooding, caused both by the granite deposits and the imbalance in the riverbank because of excessive quarrying, is a credible motive for accelerating the pace at which the problem was tackled in a valley where the memory of the 1978 disaster is still fresh. Regional sensitivity to risks of this type is also probably a key factor in the rapid pace of change in policy design at cantonal level as regards limiting use rights for quarrying in favour of safety factors. On the other hand, increased awareness of the ecological value of the Riveo-Visletto sector took longer to achieve. In all likelihood, designation of the sector as an area of national importance in the *Inventory of Alluvial Zone* contributed to accelerating this process. The natural habitat gained new credibility and demanded recognition in the regime. Finally, the spirit of co-operation between those involved, as well as their participation in a working group, created on the canton's initiative, also had its place during the transfer of use rights phase. This ensured the economic sustainability of the change in the regulatory process at the water basin level. We would also stress that the companies in question are private, contrary to the position in the previous sub-case. This fact probably acted as a brake on the pace of change initially, at least until the canton

formed the inter-disciplinary working group which resulted in the original solution of transferring the use rights.

## **5 REGIME CHANGES: SUBCASE 3: PROTECTION AGAINST WATER**

### **5.1 CHRONOLOGY**

We now move on to events located downstream in the main, at the estuary of the river with Lake Maggiore. During the 1980s, plans were drawn up for a complete reclamation project for the Maggia, comparable to the project completed on the Ticino river. Fortunately, due to the sparsity of population in Valmaggia, the project was put at the bottom of the queue. When this project was reviewed, the problem of minimum residual water flow rates and an awareness of the environmental importance of the river took precedence and the plans were definitively abandoned. The works designed to provide protection against water that we will be discussing only concern a very small part of the river, located downstream, where the dyke is absolutely vital because of the immediate proximity of the towns of Ascona and Locarno.

There is a long history of flooding in the lower part of the valley, affecting the area of Locarno first of all, but also reaching Ascona. The legal basis for the dykes at cantonal level dates as far back as 1840. This legislation requires dykes at all the rivers and streams at risk in the canton and the removal of all obstacles to a regular runoff. With the Federal Laws of 1871 and 1877, the state assumed responsibility for monitoring hydraulic structures on the water courses and granted subsidies to the cantons for remedial structures. These subsidies were used to build dykes on the Maggia commencing in 1891. The purpose of the dykes was to channel the river over a distance of three kilometres, from the Ascona bridge to the lake. Following the floods of 1924, which damaged the final 800 metres of the dyke, the central canal was widened from 50 to 90 metres, making the canal capable of bearing a flow rate of 4,000 cubic metres per second. Despite the precautions, the catastrophic flood of 1978, which marks the start of our reference period, devastated the Locarno deltaic stretch, with an extraordinary flow rate of 5,000 cubic metres per second. This disastrous flood will remain etched in the memory of the local population and marks the beginning of the changes to the regime at the

level of the water basin. To prevent catastrophe on this scale, the area needed to re-design and re-build the protective infrastructures.

The solution was the design of an infrastructure improvement project. We will follow the changes in the regulatory structure for the water basin through the development of this project. There were two main planning stages. First of all, the project proposed the construction of man-made banks in the section between the confluence of the Maggia and the Melezza and the Solduno bridge, where there are currently only the natural river banks. The next stage involved the re-construction of the existing, but very damaged, man-made banks between the Solduno bridge and the mouth of the Maggia. Included in this second stage was the rebuilding of the canal, designed to bear a flow rate of 5,000 cubic metres per second, and a 1.30-metre high safety bank. Safety also dictated that all the tall trees along the river's edge be felled. 85% of the very high cost of the project (CHF 21.5 million) is subsidized by the canton and the state. Whereas it is true to say that nobody questioned the need for these protective structures, (protection against water seems to be a self-evident use for all in the valley), the project has not met with equal enthusiasm among all the local people. In fact, if policy design has long promoted structures to channel the rivers, especially at cantonal level (*Cantonal Law on Consortiums* of 1913, *Cantonal Law on Subsidence of Dyke Structures* of 1938), it nonetheless gradually integrates competing uses and provides a basis for safeguarding the natural habitat and geomorphological processes (maintaining the natural river dynamic). 1978 saw the recognition of the need to maintain the riverbanks as a natural habitat, in both federal and cantonal regulations (*Federal law on the Protection of Nature, the Landscape and Cultural Heritage, Regulation in application of the Statutory Order of January 16, 1940 on the Protection of the Natural Heritage and the Landscape* ). At that point, environmental organisations were critical of the linearity imposed on the river and the downgrading of its banks caused by the very geometric stepped bank built along it, especially between the confluence with the Melezza and the Solduno bridge, where the natural habitat could still be conserved. A compromise was finally reached with the building of more natural mosaic-style banks. This can be interpreted as an arrangement between the informal “use rights” to the flora and fauna, defended by the WWF, and the need for hydraulic safety, for which the canton is responsible (protection use against water) and which unites all actors. According to the WWF, the “use rights” connected with the area as a natural habitat were not initially (or sufficiently) taken into account in the project. Work began on this stretch in 1979 and was completed in 1982, without any further objections.

The second section (from the Solduno bridge to the lake) was more problematic. The municipality of Locarno was especially concerned about the impact of the structures on the landscape. It also disputed the height of the safety bank. Furthermore, the WWF opposed felling the large trees and even insisted on planting more on the strips of public land bordering the river. It was particularly insistent on protecting the nature reserve it manages at the mouth of the Maggia and is of the opinion that the safety levels demanded by the project are exaggerated. It has requested that the safety requirements be re-assessed and that the project achieve a better balance between the use rights associated with protection against water and those concerning the landscape and natural habitat functions. In 1985, a compromise was finally agreed, after seven years of discussions: the building of a canal at the stretch between the Solduno bridge and the mouth of the Maggia capable of containing flow rates of 5,000 cubic metres per second, as well as a safety bank one metre high.

However, two years later, the owner of the Delta camp site, located on the left bank of the estuary and the company Terreni alla Maggia SA, owner of a hotel complex and an agricultural business on the right bank, just behind the natural reserve area managed by the WWF, submitted objections. The two owners stated that their land was insufficiently protected against water and demanded measures to safeguard their property. And, in actual fact, a breach had appeared in the unsinkable bank on the left bank. The actors rapidly reached agreement on this last point and the gap was repaired in 1989. A further demand was that the insubmersible banks be extended on the left bank for the last 300 metres before the estuary. The WWF is opposed to this addition to the banks. The municipality of Locarno is divided between these two conflicting demands. Fortunately, in 1995, an engineer working with Andreotti-Pfetsch Engineers suggested the construction of banks behind the nature reserve, a suggestion that met with approval from both sides of the argument. Work commenced in March 1997 and was completed in the winter of 1998. During the winter months of the following year, 1999, trees were planted along the banks and the strips of public land bordering them, following a study conducted by Dionea SA, a firm of engineers and biologists, on the balance between safety and protecting the environment. The construction was completed in early 2000.

The change in the regime may be described as follows: at the outset of the period of reference, protection against water took precedence in policy design. However, we then saw a progressive incorporation of other uses in planning the development of the riverbanks with a view to ensuring hydraulic safety. Protection against water remains very much to the forefront, but it

must accommodate other uses, such as natural habitat or landscape functions. This compromise is also evident at the level of the water basin, where the plans for the riverbank structures were initially little inclined towards respect for the informal use rights of the flora and fauna. The plans gradually became more environment-focussed as environmentalists fought their corner, without however, obscuring uses connected with maintaining hydraulic safety.

The table below illustrates the increasing environmental awareness of policy design and the compromises achieved in the regime for the water basin. It should be noted that at the beginning of the period under review, several measures aimed at promoting protection against water were already in process.

	<i>Policy design</i>	<i>Regulatory system</i>
1966	<i>Federal law on the protection of Nature, the Landscape and Cultural Heritage</i> : recognised the value of the banks as a natural habitat.	
1974	<i>Regulation in application of the Statutory Order of 16 on the Protection of the Natural Heritage and the Landscape</i> : Public works, therefore dykes, may not damage or disturb the landscape.	
1979-1982		Conflict followed by compromise between the informal “use rights” to the fauna and flora, championed by the WWF, and hydraulic safety, the canton's responsibility, during the first stage of the construction of dykes.
1988-1995		Conflict between the landowners, defending their rights to enjoy the use of their land (guaranteed by protection against water) and the WWF, defending the informal “use rights” to the fauna and flora and their nature reserve. Compromise in 1995.
1990	<i>Cantonal Law on Territory Subject to Natural Hazards</i> : required the planning of structures to provide protection against water.	

	<i>Policy design</i>	<i>Regulatory system</i>
1991	<i>Federal Law on the Protection of Water: Art. 37:</i> water courses may only be changed for the purpose of protecting people or important assets. The natural course of the water must be respected and the natural habitat functions maintained.	
1991	<i>Federal Law on Fishing:</i> technical works, including the dykes, subject to granting of authorisation from the competent canton department Required the fish's natural habitat to be protected	
1991 and 1994	<i>Federal Law on the Development of Water Courses and Statutory Order on the Development of Water Courses:</i> integrated measures for protection against water and respect for the natural habitat and geomorphological functions.	
1992	<i>Decree on the Protection of Alluvial Zones:</i> the nature reserve at the mouth of the Maggia was listed. The canton took over management of the reserve from the WWF, under the supervision of the state. Operations related to ensuring hydraulic safety tolerated, provided renaturation measures are be undertaken.	
1996	<i>Cantonal Law on Fishing and the Protection of Indigenous Fish and Crayfish:</i> if technical operations, including the dykes, cause damage to the fish or their habitat, payment of compensation is required. Required protection of the aquatic fauna's natural habitat.	

## 5.2 ASSESSMENT OF REGIME CHANGE

It now remains to assess these changes according to the five dimensions of governance and the co-ordination between the regulatory system and policy design.

**Dimension 1: Administrative co-ordination for the water basin. To what extent does the regulatory system and policy design take the resource into account at the level of the water basin?**

As in the previous two sub-cases, we cannot state that protection against water is currently managed at water basin level, nor can we state that there is true vertical co-ordination on this

issue. The project for the total reclamation of the Maggia during the 1980s could have been an example of this as it considered the water basin in its totality. However, this approach takes account of only one use at the expense of all others, and we cannot, therefore, consider it as progressive under any circumstances from the point of view of integration. Nonetheless, we should stress that the structures of actors specifically linked to the subject of the dykes exist in Ticino since the enactment of the *Cantonal Law on Consortiums* in 1913. The consortiums are meetings of the various local bodies involved in planning work, in particular the municipalities that own the land requiring protection against water. This is the case of the *Consorzio correzione fiume Maggia* [Maggia river correction consortium]. While this consortium is involved in the Maggia delta project described above, it nonetheless does not incorporate the whole water basin. The canton is currently attempting to disband the old consortia and replace them with broader-based bodies. The latter could be considered as being on the scale of the water basins, for example, this is true for *Consorzio Rovana-Maggia-Melezza*, which to a certain extent corresponds to the geographical unit covered by this study.

**Dimension 2: Involvement of all interested actors. To what extent does co-operation exist between those involved in public policy and the users of the resource? To what extent do private actors have a stated position with the ownership rights to back up this position?**

In the main, the development plan for the Maggia delta concerns the canton and the municipalities, which are obliged to ensure the functions of protection against water are ensured. Other non-state actors involved fall into three main categories: the first category is the land owners, holding property rights to the land bordering the river that is subject to the risk of flooding. The position of these landowners is generally in favour of protection against water uses in order to defend their assets. Thus, they oppose all attempts at compromise with competing uses. They have no particular difficulty defending their position in that these lands belong to them and policy design clearly grants them the right to hydraulic safety, and this for some considerable time. A second category of non-state players is the environmentalists and, most especially, the WWF, which is heavily involved in ensuring the ecological dimension of the dyke project. They defend the “use rights” to the fauna and flora associated with the natural habitat of the river and with particular emphasis on its banks, as well as the landscape uses. These use rights are increasingly highlighted in policy, providing environmentalists with a basis for their demands. Furthermore, the WWF has formal use rights to the nature reserve

located at the mouth of the Maggia. The land actually belongs to the company, Terreni alla Maggia. In the 1980s, the company signed an agreement with the WWF for a 20-year period entrusting it with the surveillance and protection of this land. The area was listed as part of the *Inventory of Alluvial Zones of National Importance* at the beginning of the 1990s and its management transferred to the canton, under the supervision of the state, in order to protect its function as a natural habitat. Naturally, this situation supports the WWF in its demands. Finally, we would add the right to appeal granted to the association at the end of the 1960s. This right enables it to officially oppose the current dyke project. The third and final category of non-state players consists of the firms of experts, who generally position themselves on the side of a carefully thought-out compromise between protection against water and the landscape and natural habitat uses, especially at the end of the period of change. These firms have the advantage of the attention and respect of the administration, which often collaborates with them.

To conclude, we are of the opinion that, while it is not possible to say that there was a true process of integration brought about through co-operation between the actors, it is true to say that non-state bodies have been enabled to participate in the project and to defend their positions through their use rights and ownership, as well as the possibilities offered by the right to appeal.

**Dimension 3: Scope. To what extent do public policies incorporate all uses of the resource?**

Before the change, it was mainly protection against water that took precedence. During the period of change, we witnessed a gradual incorporation into policy of other competing uses, such as the natural habitat or landscape functions. The same process is evident if we look at the implementation of the Maggia delta development project. Therefore, it is our opinion that scope has been expanded and that the compromises achieved on the ground incorporate all uses.

**Dimension 4: Coherence. To what extent do policy measures target all users of the resource and, more specifically, the players of central importance for change in that they hold the determining ownership rights? What redistribution of use rights are evident in this context?**

Projects such as the total reclamation of the Maggia, commenced before the change, illustrate very low levels of coherence at the time in that policy design does not at all consider all users of the resource, thus giving rise to conflict. Changes in policy design incorporated and promoted the informal uses associated with the natural habitat and landscape functions. One could say that public policy is consistent with this insofar as it restricted use rights connected with protection against water. However, it is not certain that we can truly speak of weakening these use rights. In fact, protection against water has never really been questioned or restricted. It is considered as necessary by all involved. It is more correct to describe the redistribution of use rights as the formulation of a compromise between rival uses, mainly through qualitative modifications to the dyke project, the purpose of which remains hydraulic safety. The construction of dykes in a mosaic structure planted with vegetation is an example of this. For environmental associations, these compromises are seen as the absolute minimum that must be defended. In the valley, protection against water remains a priority.

**Dimension 5: Co-ordinating the application of the measures at the level of the water basin. To what extent do public policies rely for their implementation on public organisations and resources and to what extent do these use the regulating capabilities inherent in the ownership rights belonging to the regulatory system? In other words, is implementation from the top down or does policy facilitate a bottom-up approach by users themselves by granting them certain ownership rights?**

There is no easy answer to this question as the champions of different uses are spread through all levels in this sub-case. In terms of the water basin, there are as many environmental associations as landowners, both attacking the dyke project using their right of appeal, but with opposing objectives. The canton is split between its responsibility to provide protection against water and its progressive responsibility to protect the natural habitat and landscape. Whereas the state can take its share of the blame for the subsidence, which enabled the dyke work to proceed, it also designated the nature reserve at the mouth of the Maggia as an alluvial site of national importance. As regards the change itself, i.e. the incorporation and promotion of the natural habitat and landscape functions in the framework of the dyke project, we would stress the importance of the WWF's opposition using its right of appeal. This process could certainly be described as bottom-up. It saw its efforts supported at the end of this period by federal measures (top-down), both in terms of changes in policy design and at the level of the water basin, the designation of the nature reserve.

### **5.3 CONTRIBUTION TO SUSTAINABILITY**

Clearly, the technical compromises achieved as a result of pressure from the WWF have improved the situation from the point of view of ecologically sustainable development. Furthermore, let us recall the project for the total reclamation of the Maggia in the 1980s, fortunately abandoned as a result of changes in mindset and the general process of developing a more environment-focussed regime. Viewed from this angle, the changes to the regime avoided a veritable ecological disaster. Other rivers in Ticino were not as lucky and the course of the Ticino River was significantly altered. The WWF considers that the Maggia Delta escaped the worst. Nonetheless, according to the defenders of the environment, no “corrective measures” are innocuous and the condition of the banks must continue to be monitored. For our part, we can state that the impact of these infrastructures on the landscape is significant. However, all actors acknowledge that they are inevitable. Economic and social sustainability must also be guaranteed for the towns of Locarno and Ascona, seriously threatened by the Maggia's floods. A dyke project that would excessively compromise protection against water in favour of competing uses could not be described as sustainable from an economic and social point of view. Overall, we can describe the compromise between the different interests in the area in the context of the change in the regime as a contribution to sustainability.

### **5.4 CONDITIONS FOR REGIME CHANGE**

Undoubtedly, the process of integrating rival uses to protection against water is complex in a region where floods have wreaked their damage and taken their toll of lives since time immemorial. Nonetheless, we must look to the catastrophic flood of 1978 for the origins of the development project that gave concrete form to the change in the regime for the water basin. The WWF has played a major role in implementing this change, based on the hypothesis according to which the integration process requires voluntary action on the part of a motivated group of people. The process is based on policy design developments incorporating a progressive increase in ecological awareness, reflecting a profound change in mindset towards recognition of the value of the natural habitats. The action of environmentalists is made possible by two phenomena. First of all, we wish to stress the importance of their right of appeal. This has been the means for them to oppose the dyke project and to champion uses neglected by the project, even though their incorporation is dictated by policy. On the other hand, the fact that the WWF successfully manages a nature reserve in the sector that falls within the scope

of the development project and, therefore, has recognised use rights for this reserve, in all probability played a positive part in making their demands heard and hence in effecting change. Finally, as in the other sub-cases, we noted involvement at federal level in favour of changes to the regime and in particular, in favour of implementing these changes at the end of the period. Undoubtedly, this intervention on the part of the state constitutes very effective support for the efforts of local people involved in the integration process.

## 6. CONCLUSIONS FOR THE WATER BASIN AS A WHOLE

In describing these three sub-cases we travelled throughout the water basin, from the catch systems and artificial lakes of the upper Valmaggia to the structures at the estuary with Lake Maggiore. We would now like to review the phenomena that recur around the three central variables of this research, i.e. the changes to the regime at the level of the water basin, the consequences of these changes for sustainability and, finally, the conditions for development.

In terms of the change *per se*, the three sub-cases are consistently unanimous. At the level of the water basin, the changes to the system are reflected in the emergence of the primacy of protecting the water to the detriment both of protection against water (sub-case 3) and the use of the water resource (sub-cases 1 and 2). The increasing environmental focus of the regime we found at federal level is also evident at water basin level. This phenomenon is accompanied by an increase both in scope and in coherence of policy. Before the change, we saw policy that clearly favoured exploitation of the water resource and protection against water. After the change, the system sought to accommodate protection of the water with a view to finding a means of enabling all uses to co-exist in the water basin. Coherence is shored up by the fact that before the reference period, only formal use rights were taken into account by policy design in both its causal and operative hypotheses. After the change, users with informal use rights were recognised and considered by public bodies as target groups. The change also heralds an approach to deal with conflicts of use in an integrated and global manner, not only as regards the uses themselves (inter-use linkages but also inter-resource linkages, especially in relation to the land or landscape) but also in terms of the water basin as a geographical entity.

The change process itself has been a complex one, heavily influenced by the specific features of the Swiss political system (the Popular Initiative and right of appeal) and can be described

as either bottom-up or top-down. In all of the sub-cases above, we noted the key role played by the local users of the resource, especially at the beginning of the change process (initial impulse as bottom-up). This trend towards change was then affirmed and its implementation supported at federal level in a top-down approach at the completion of the change process. However, the unique consultation mechanisms in the Swiss political system ensure that users are involved throughout the process.

In terms of its impact on sustainable development, the change has resulted in improvement overall for the water basin. Evident in all three sub-cases is a consistent attempt to reconcile the ecological, economic and social dimensions of sustainable development. This said, enhancement of the environmental dimension is slow and complex. In addition, this dimension presents the most difficulty in implementing change, whereas economic measures do not pose the same challenges, a fact that highlights the importance of environmentalists' right of appeal. The slow pace and fragile nature of improvements to ecological sustainability thus remain a source of anxiety in the Valmaggia, although overall the changes to the regime are favourable to sustainable development in the region.

There are similarities across the three sub-cases in terms of conditions favourable to fostering change. These conditions include:

- Visibility and evidence of conflicts of use and their negative consequences, especially in terms of hydraulic safety (an important driving force for change in the valley as a result of the traumas of 1978), but also in terms of the natural habitat.
- Existence of relevant scientific information, for example, in the form of expert reports.
- Effective dissemination of information to those involved, especially through the local press, which mobilised public opinion
- Involvement of motivated people at water basin level and, in particular, organised bodies with legitimate use rights.
- Spirit of co-operation between the actors and the incorporation of non-state and other users involved in the conflict in appropriate structures, for example in representative working groups.
- Existence and use of several resources in the Swiss political system, particularly direct democracy and the right to appeal enjoyed by NGOs.

- Parallel developments in the regimes for other resources, such as the land or the natural heritage where we also witness the development of a more environmentally friendly policy followed by the implementation of change.
- Support at federal level for the implementation of change.

Without question, the simultaneity of these diverse variables coupled with a profound change in attitude in favour of protecting the environment enabled changes in the institutional regime governing water towards wider integration at water basin level.

We would make one final comment: despite very clear change towards more integrated resource management, we must state that there is no mechanism focussed on water basin level itself, either in the Valmaggia or elsewhere in Switzerland. One possible explanation is connected to the regulatory system – in Switzerland, there is no common property. The structure of ownership at water basin level is excessively complex. The water itself belongs to the canton while the banks are generally divided into various lots and owned privately, by the municipalities or the canton. In all likelihood, this very fragmented structure plays against integrated resource management specifically in terms of the water basin, even if we do see signs of integration at all other levels.

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